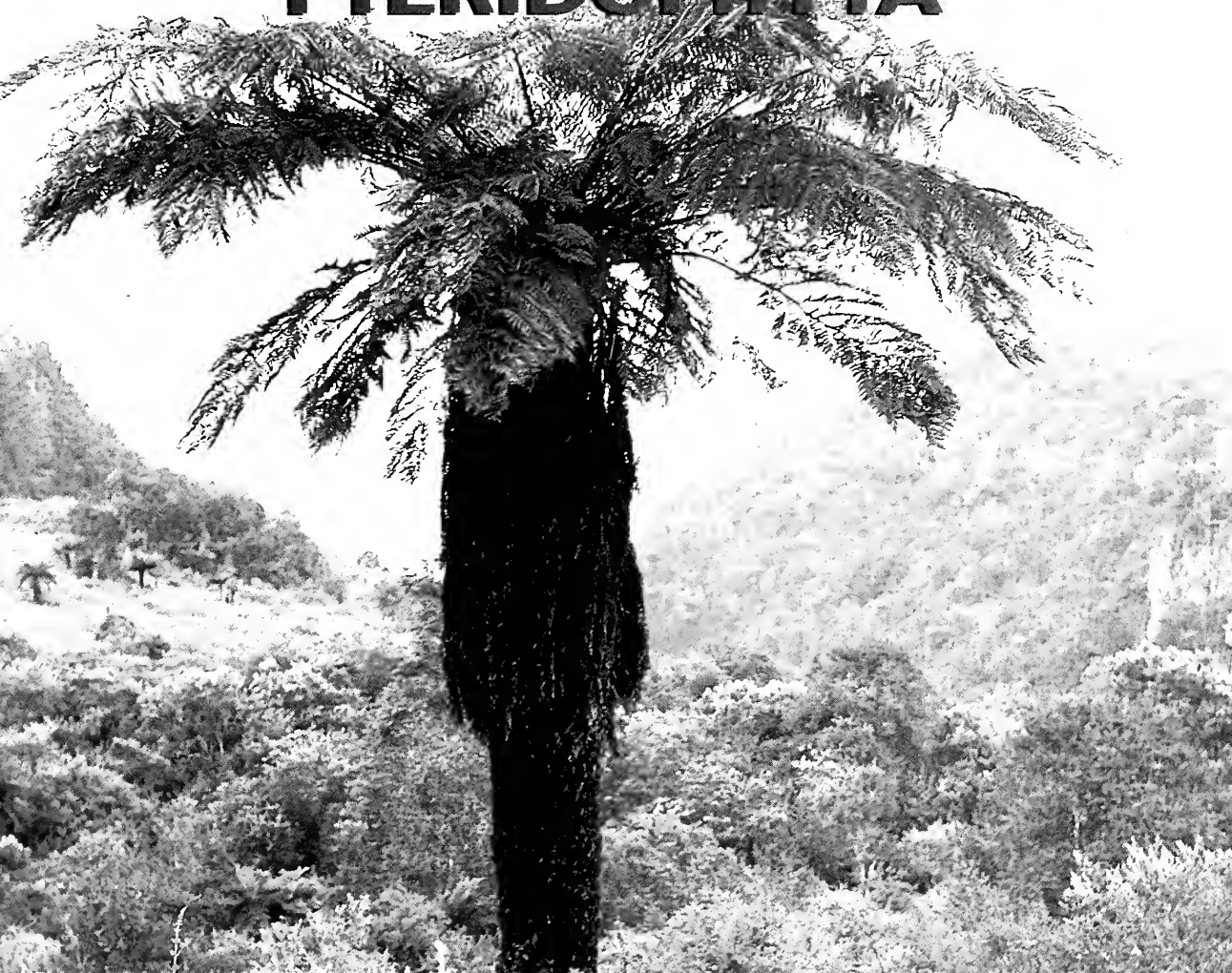


# **CONSPECTUS OF SOUTHERN AFRICAN PTERIDOPHYTA**



**J.P. ROUX**

**Southern African  
Botanical Diversity Network Report No. 13  
November 2001**

# About SABONET

This publication is a product of the Southern African Botanical Diversity Network (SABONET), programme aimed at strengthening the level of botanical expertise, expanding and improving herbarium and botanic garden collections, and fostering closer collaborative links among botanists in the southern African subcontinent.

The main objective of SABONET is to develop a strong core of professional botanists, taxonomists, horticulturists and plant diversity specialists within the ten countries of southern Africa (Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe). This core group will be competent to inventory, monitor, evaluate, and conserve the botanical diversity of the region in the face of specific development challenges, and to respond to the technical and scientific needs of the Convention on Biological Diversity.

To enhance the human resource capacity and infrastructure available in the region, SABONET offers training courses, workshops and collaborative expeditions in undercollected areas. The programme produces a newsletter, *SABONET News*, and a series of occasional publications, the *Southern African Botanical Diversity Network Report Series*, of which this publication is part.

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# CONSPECTUS OF SOUTHERN AFRICAN PTERIDOPHYTA

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An enumeration of the Pteridophyta of Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa (including the Marion Island group), Swaziland, Zambia and Zimbabwe



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*B*OTANICAL  
INSTITUTE



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### Cover

Main picture: *Cyathea dregei* Kunze. Small pictures (from left to right): *Woodsia montividentis* (Spreng.) Hieron., *Asplenium holstii* Hieron., *Lygodium kerstenii* Kuhn. Photographed by the author.

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## FOREWORD

The immense southern African subcontinent has a diverse topography, geology and climate, which are the main factors regulating plant distribution. The numerous gradients between, e.g. humid coastal vegetations, montane forests, alpine meadows and hot deserts create special environments in which specialized plants thrive. 490 different pteridophytes (ferns and fern-like plants) are enumerated in this *Conspectus*, and more may await recognition or description.

Vegetation zones and plants usually do not stop at artificial political borders, though floras often do. Regularly pteridophytes are omitted from such regional treatments and checklists, and many amateurs and botanists consider them too difficult to identify, thus ignoring them.

Those venturing to study ferns soon discover a multitude of systematic works, often in 'foreign languages', from which it is difficult to choose. Next to many monographs, at least six 'modern' floras (Launert in Merxmüller 1969; Lawalrée 1969, 1986, 1993; Schelpe 1970, 1977, Schelpe & Anthony 1986; Schelpe & Diniz 1979) written in four different languages, exist for the present area. After deciding which systematic arrangement to follow, using a microscope and microcharacters for identification is one of the major obstacles fern enthusiasts should be prepared to take.

The present checklist, based on an impressive amount of literature, is a fundamental guide for all botany students from the SABONET region, as well as for the botanically interested traveller.

Written by South Africa's leading pteridologist, Koos Roux, who visited several regions in the subcontinent, this publication continues the work of his famous predecessors, Sim and Schelpe. This list of modern and current names of ferns in the SABONET region, with keys and illustrations, is the first major contribution bringing together contemporary knowledge about pteridophytes in an accessible way.

The book is rightly called a '*Conspectus*', as much more fundamental work needs to be done before a definite flora of the region can be written. If it contributes to a greater interest in these beautiful and intriguing plants, I consider it a great success.

### **Ronald L.L. Viane**

Director of Ghent University Botanic Garden, Belgium  
General coordinator of the Group of European Pteridologists (GEP)  
Ghent, 26 November 2000



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## NEW COMBINATIONS PUBLISHED IN THIS VOLUME

**Amauropeltā** Kunze section **Uncinella** (*A.R.Sm.*) *J.P.Roux*, comb. nov.

**Blechnaceae** (*C.Presl*) *Copel.* subfamily **Stenochlaenoideae** (*Ching*) *J.P.Roux*, comb. et stat. nov.

**Christella buchananii** (*Schelpe*) *J.P.Roux*, comb. et stat. nov.

**Crepidomanes borbonicum** (*Bosch*) *J.P.Roux*, comb. nov.

**Crepidomanes frappieri** (*Cordem.*) *J.P.Roux*, comb. nov.

**Crepidomanes inopinatum** (*Pic.Serm.*) *J.P.Roux*, comb. nov.

**Crepidomanes inopinatum** (*Pic.Serm.*) *J.P.Roux* var. **majus** (*Tāton*) *J.P.Roux*, comb. nov.

**Crepidomanes melanotrichum** (*Schlttdl.*) *J.P.Roux*, comb. nov.

**Odontosoria afra** (*K.U.Kramer*) *J.P.Roux*, comb. nov.



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The SABONET (Southern African Botanical Diversity Network) steering committee afforded me the opportunity to visit the LMA, LMU, LUAI, LUBA, MAL, NDO, SRGH, UZL and WIND herbaria and to do fieldwork in the respective countries.

I wish to express my sincerest gratitude to all these people for their kind co-operation and interest. Without their support, this project would never have come to a conclusion.

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## INTRODUCTION

The Pteridophyta are probably a polyphyletic group of plants consisting of four extant classes (following Pichi Sermolli 1958b; Kramer & Tryon 1990): Psilotopsida (Psilotaceae or whisk ferns), Equisetopsida (horsetails), Lycopodiopsida (lycophods) and the Filicopsida (true ferns). The phylogenetic relationships between these groups have been much-debated (Jeffrey 1902; Eames 1936; Smith 1938; Bierhorst 1977), but remain largely unresolved (Wolf *et al.* 1998).

Many families and genera are not clearly derived from, nor are they obviously ancestral to another family or genus. The problem in depicting phylogenetic relationships in these groups is caused by the lack of information in which primitive or advanced character states can be assessed; evidence for the course of evolution has largely been lost through extinction. Also, the fossil record as currently known, provides inadequate evidence for phylogenetic analyses. However, in spite of the lack of information, several phylogenetic classifications have been proposed for the Filicopsida, or part thereof (e.g. Ching 1940a; Alston 1956b; Wagner 1969; Holttum 1947, 1973a; Mickel 1974; Crabbe *et al.* 1975; Lovis 1977; Pichi Sermolli 1977b).

Most of these schemes are based on morphological and/or cytological characters and, despite the many differences among them, there is consensus in some parts. Four areas of agreement were noted among these systems: 1) the Ophioglossaceae and Marattiaceae, the eusporangiate ferns, are distant relatives of the leptosporangiate ferns; 2) about ten families, five of them occurring naturally in our area are regarded as 'primitive' i.e. branching early with respect to the other families; these include the Osmundaceae, Schizaeaceae, Lygodiaceae, Anemiaceae, Gleicheniaceae, Hymenophyllaceae and Cyatheaceae; 3) families considered as having derived more recently include the Dennstaedtiaceae, Pteridaceae, Vittariaceae, Polypodiaceae, Grammitidaceae, Thelypteridaceae, Dryopteridaceae, Aspleniaceae and Blechnaceae and 4) the 'advanced' leptosporangiate ferns have had more than one origin, with Pteridaceae 'derived' from the schizaeoid stock, the Polypodiaceae and Grammitidaceae from gleichenioid progenitors, and most of the remaining families from dennstaedtioid ancestors (Smith 1995).

More recently Hasebe *et al.* (1995) and Pryer *et al.* (1995) presented analyses in which genera of most families were sampled. The data sets comprised of *rbcl* nucleotide sequences and morphological and *rbcl* sequences combined, the results of which turned out to be largely congruent. In molecular systematics the *rbcl* nucleotide data alone are not highly informative for inferring relationships among groups of vascular plants, but it provided evidence for many well-supported clades within the true ferns (Hasebe *et al.* 1994, 1995; Wolf *et al.* 1994). The cladograms generated supported, but also differed in some respects from most of the previous phyletic hypotheses. Support is provided for the monophyly of the leptosporangiate ferns with Osmundaceae at the base. The Gleicheniaceae and Hymenophyllaceae are relatively well-supported lineages near the base of the leptosporangiate ferns, and the schizaeoid ferns proved to be monophyletic. Also, the heterosporangiate ferns were shown to be monophyletic and form one of the basal lineages. The next lineage to diverge is the tree ferns, which also proved to be monophyletic. The Pteridaceae (*sensu* Tryon *et al.* 1990) are monophyletic, but the Vittariaceae are nested in the group. Both the Dennstaedtiaceae (*sensu* Kramer 1990a) and Dryopteridaceae (*sensu* Kramer *et al.* 1990b) are paraphyletic and possibly polyphyletic. The remainder of the leptosporangiate ferns forms a monophyletic group.

Progress in systematics rarely comes from focussing on only one type of data. Taking into account morphological information from fossils and extant taxa, as well as molecules, has resulted in many of the more robust insights into phylogeny (Patterson 1987). Most significant of the strict consensus tree based on combined data (morphological and *rbcl* sequence data) is that it provided a better resolution than the separate analysis (Pryer *et al.* 1995). Apparently, *rbcl* sequence data and morphology provide optimal information at different levels in the phylogeny; *rbcl* for more recent differences, and morphology for older events and, together, the information is complementary (Wolf *et al.* 1998). It may therefore be stated that an increase in the number of gene sequences and the number of morphological characters may help further to resolve the phylogeny of the true ferns and that of the pteridophytes as a whole. While consensus on different lineages is gradually being achieved, there are still many groups of uncertain affinity. This has presented some difficulties in how the different groups should be presented in a work such as this.

The aim of this work is not to present new and untested hypotheses on pteridophyte phylogeny. The classification followed here is essentially that of Tryon & Lugardon (1990) which, in turn, is largely based on the system of Tryon & Tryon (1982b). The latter is based on character similarities rather than on presumed phylogenetic relationships. In order to avoid using a completely outdated scheme, deviations from this system are largely in the Dennstaedtiaceae and Dryopteridaceae, which consistently proved to be either polyphyletic or paraphyletic (Wolf 1995; Pryer *et al.* 1995). In the Dennstaedtiaceae *sens. lat.* the lindsaeoid ferns are recognized as a distinct family, and the Tectariaceae and Woodsiaceae are separated from the Dryopteridaceae *sens. lat.*

The unique seven-digit number preceding the generic name is the number used in the **PRECIS** (National Herbarium (**PRE**) Computerised Information System) database of the National Botanical Institute. The numbering system should not be interpreted as an accurate reflection of phylogenetic relationships between families and genera, but is merely retained for convenience as the herbaria of the National Botanical Institute, as well as several herbaria participating in the **SABONET** (Southern African Botanical Diversity Network) initiative, are arranged according to this system. Subfamily and subgeneric arrangements generally follow the most recent monographic study, whereas the species, as a matter of convenience, and a lack of monographs reflecting evolutionary relationships, are arranged alphabetically.

Family and generic descriptions and discussions in the *Conspectus* are concise and supported by synonymy, information on the type collections, chromosome numbers obtained from southern African material where available, distribution within Africa by country, habitat and ecological notes, and published illustrations. Descriptions are based on southern African material only. Sixteen plates of line drawings depicting various anatomical, micro- and macromorphological characters supplement the descriptions. Observations on the root anatomy are largely based on the work of Schneider (1996). The gametophyte descriptions are based on the work of Twiss (1910), Stokey (1930, 1950), Bierhorst (1953, 1954), Stokey and Atkinson (1954, 1956, 1958),

Atkinson (1960, 1962, 1967), Nayar *et al.* (1967), Nayar & Kaur (1968, 1971), Chandra & Nayar (1970), Farrar (1974), Raghavan & Huckaby (1980) and Roux (1993b). Spore germination patterns follow Nayar & Kaur (1968) and Raghavan & Huckaby (1980) and prothallial development patterns are based on the work of Nayar & Kaur (1971). Alien taxa established in one or more localities, other than under cultivation, are considered naturalized and are included and asterisked (\*). Type specimens that have been examined are indicated by an exclamation mark (!).

Keys to the families, genera and species and, where applicable, also to the subfamilies, tribes, subgenera, sections, subspecies and varieties, are provided.

Herbarium abbreviations follow Holmgren *et al.* (1990) and author abbreviations follow Pichi Sermolli (1996).

Notes on the preparation of herbarium specimens are provided as an addendum.



## HISTORICAL OVERVIEW

Exell (1960) provides a brief overview of botanical exploration for the *Flora zambesiaca* (Botswana, Malawi, Mozambique, Zambia and Zimbabwe) area, whereas Gunn & Codd (1981) provide a more detailed account of the botanical exploration of the southern African region. In the notes below, a brief overview of the exploration of the pteridophyte flora for the southern African region is provided.

### The early Cape period

As the sea-route around the southern tip of Africa became better known during the latter part of the 17th century, more landings were made at the Cape to replenish the vessels with fresh water. Small plant collections were shipped back to Europe during this time, but none of them appeared to have contained any pteridophytes. The first known fern collections from the region are those made well after the settlement of the Cape in 1652.

The first known fern collections made at the Cape are those of Adair who collected there during the 1680's. These collections were given to his friend Leonard Plukenet, a British botanist and physician who, in 1696, illustrated and published them as part of his *Almagestum botanicum*. Few Cape ferns were available to Linnaeus and in his *Species plantarum* (1753) only two species based on plants from this region were described. In both species reference was made to the illustrations of Plukenet.

As an addendum to the *Flora indica*, N.L. Burmann in 1768 published his *Prodromus florae capensis*. In this volume 13 fern species were listed of which five were newly described. Some of these appear to be based on collections made by Paul Hermann while at the Cape in 1672 and again in 1680 (Gunn & Codd 1981; Roux 1994b). J. Burmann (1737) also published a list of plants observed by Hermann at the Cape.

König, a Danish physician and naturalist who stayed at the Cape from 1–28 April 1768, included a small number of ferns in his collections which were shipped back to Linnaeus. Two species, *Onoclea polypodioides* (= *Gleichenia polypodioides* (L.) Sm.) and *Polypodium caffrorum* (= *Mohria caffrorum* (L.) Desv.), described by him in the *Mantissa plantarum, altera* (1771b) are based on these collections.

The first account of the Cape flora, the *Prodromus plantarum capensium* of Thunberg (1800), included 13 genera and 29 species of ferns. This account was based principally on collections he made on his travels at the Cape during the years 1772–1775. In 1818 Schrader's *Analecta ad floram capensem* appeared in the *Göttingische gelehrte Anzeigen*. This unfinished work on the Cape ferns, in which several new species were described, increased the number of taxa for the region to 23 genera and 69 species. The *Adumbratio filicum in promontorio bonae spei provenientium* of Von Schlechtendal, which appeared in five parts during the years 1825–1832, was the first publication that dealt entirely with the Cape ferns. This well illustrated work was based primarily on the collections made at the Cape by Bergius, Mund and Maire. Also, in this work, a number of new species were described. Several collections that may contain specimens eligible as types for these species are currently housed in the herbarium of the Martin-Luther-University Halle-Wittenberg (Braun 1998). C.F. Ecklon reached the Cape in 1823 and also shipped material back to Europe. Kaulfuss (1831) studied some of his pteridophyte collections. Following this and based primarily on the vast collections of Drège, Ecklon, Zeyher and several other prominent collectors at the time, Kunze in 1836 published his *Acotyledonearum africae australis recensio nova*, a work that appeared in *Linnaea* volume 10. This work was reprinted twice during that year, each time with a different title (Roux 1986). Several new species were described here bringing the total fern genera known for the region to 33 and the number of species to 123, a figure that excludes varieties and forms. Of these, 29 were newly described species, 23 new varieties, six new forms and seven new combinations. The system he adopted was that of Kaulfuss published in 1827 in his *Das Wesen der Farrenkräuter*.

### The colonial era

The gradual colonization of the African continent during the 19th century by Belgium, Britain, France, Germany, Italy, Portugal and Spain resulted in the opening up of new as yet unexplored frontiers. This resulted in an increasing number of botanical collections being shipped back to Europe. In 1858, however, Pappe, the first colonial botanist at the Cape, and Rawson, colonial secretary at the time, published their *Synopsis filicum africae australis* which is an enumeration of the fern flora of South Africa as it was known at the time. The classification they adopted mainly follows that established by Presl (1836) in his *Tentamen pteridographiae*. This account brought the number of ferns for the region to 54 genera and 161 species of which 12 were newly described.

With numerous colonial settlements now well established on the continent, large collections of African plants have assembled in the most important herbaria of Europe. Notable are the collections of Boivin and Bojer (Madagascan region), Mann (Bioko, Gabon and Cameroon), Barter (Sierra Leone), Kersten (Tanzania), Smith (Congo), Heudelot (Senegal), Welwitsch (Angola) Drège, Ecklon and Zeyher (South Africa) and Schimper and Steudner (Ethiopia). These and numerous other collections allowed Kuhn, in 1868 to publish his *Filices africanae*. This was the first account of the fern flora for the entire African continent including the Atlantic Ocean Islands, Madagascar and the Madagascan region. The number of species for the region, excluding subspecific taxa, came to 683 arranged in 59 genera. Several new taxa were also described in this work. The classification he adopted is that of Engler & Prantl (1899) published in the *Die natürlichen Pflanzenfamilien*.

As the flora of the African subcontinent became better known, so knowledge of the geographical regions covered by the fern floras that followed increased. In 1892 Sim published *The ferns of South Africa*, but the region accounted for was that south of the Tropic of Capricorn. He recognized 179 species for the region and the classification he adopted was that of W.J. Hooker (1844–64) adopted in his *Species filicum*.

A demand for an enlarged pteridophyte flora that encompassed Zimbabwe and the neighbouring territories was indirectly brought about by the gold mining industry established in that country during the turn of the 19th century. As an elaboration of the first edition of *The ferns of South Africa*, Sim in 1906 compiled a list of species occurring south of the Zambesi River bringing the total to 212. This ultimately resulted in the publication of a second edition of the *Ferns of South Africa* in 1915. Not only was the scope of the book increased but the number of collections studied was also more numerous. The number of species recognized increased to 220 and, as a result of the publication of Christensen's *Index filicum* during the years 1905–1906, the classification system he adopted was changed. Sim now used the Englerian system. Although this updated and expanded second edition served as the standard reference for many years, it soon became outdated as a result of the vast amount of fern research that took place during the years that followed. Numerous papers dealing with the fern flora of South Africa were published during the following period, but no major works on the South African pteridophyte flora *per se* appeared for many years.

Floristic accounts of the pteridophyte floras for several of the southern African countries were published during the period 1969 to 1986. The first account of the pteridophyte flora of Mozambique was that of Alston (1954) in which 97 species were enumerated. Launert in 1969 compiled a fern flora for Namibia as part of Merxmüller's *Prodromus einer Flora von Südwestafrika*. This, in 1970, was followed by an account of the pteridophyte flora of Mozambique, Malawi, Zambia, Zimbabwe and Botswana and published by Schelpe as part of the *Flora zambesiaca* project. The classification followed here, as well as in all the subsequent publications of Schelpe, is based on the system proposed by Alston in 1956b whereby the Polypodiaceae *sensu lato* were subdivided into several families. Alston proposed this system in anticipation of his treatment of the *Ferns and fern-allies of West tropical Africa* that was published in 1959. This was followed seven years later by an account of the pteridophyte flora for Angola as part of the *Conspectus florae angolensis*. In 1979 Schelpe and Diniz produced a floristic account of the pteridophyte flora of Mozambique as part of the *Flora de Moçambique* project.

## The post colonial era

Realizing the need for an updated treatment of the pteridophyte flora for South Africa Jacobsen, in 1983, published *The ferns and fern allies of Southern Africa*. This comprehensive treatment deals with the fern flora of Namibia, Botswana, Zimbabwe, and the southern half of Mozambique, South Africa, Swaziland and Lesotho. Also provided in this work is an extensive survey on the distribution and ecology of the ferns from this region. It was only in 1986 that Schelpe and Anthony, as part of the *Flora of southern Africa* project, published an account of the pteridophyte flora of the region. This treatment includes the countries South Africa, Lesotho, Swaziland, Namibia and Botswana. More recently, Burrows (1990) published his *Southern African ferns and fern allies*. In this richly illustrated account, the pteridophyta occurring south of the Cunene, Kavango and Zambesi Rivers are dealt with. Both the works of Jacobsen and Burrows follow the classification of Alston (1956b).

An increasing number of floristic accounts for many parts of the world were published during the past 25 or more years. This, together with the steady flow of monographic studies where more modern techniques are often employed, frequently led to a better understanding of the phylogeny of the groups. These developments, the discovery of new species, and the recording of new distributions for many species render most of these works somewhat outdated.

In this work, a synopsis of the pteridophyte floras of the ten southern African countries (Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa (including the Marion Island group annexed by South Africa on 26 December 1947), Swaziland, Zambia and Zimbabwe) is provided, the aim being to collate all available information on the subject and to provide a modern account of the pteridophyte flora of the subcontinent based on recent developments in the field. The *Conspectus* is based on the floristic accounts listed above, the numerous more recently published papers, the study of herbarium collections and fieldwork done in several of the countries. Species naturalized in the region are also accounted for.

The political instability in many parts of the region and the civil wars during the latter part of the 20th century that lasted for more than 20 years in Mozambique, and still continuing in Angola, resulted in a deterioration and even destruction of the infrastructure of those countries. Floristically, many areas within the region therefore remain poorly known. Many more records will no doubt be added to the flora of the region as stability returns and floristic studies can resume. Of grave concern, however, is the poverty this political instability caused amongst the inhabitants as more people were, and still are, forced into subsistence farming. This in turn places more pressure on the natural vegetation with the result that many species may not be conserved or even recorded.



# PHYTOGEOGRAPHY

## The palaeoenvironment of southern Africa

Africa, when compared with other tropical parts of the world, supports a floristically impoverished vascular flora (Brenan 1978). This phenomenon is also reflected in the pteridophyte flora of the continent (Tryon 1986b). The cause of this meagre flora is ascribed to the isolation of Africa from the other continents since the mid-Cretaceous and the subsequent significant changes in the climate caused by uplift, continental drift, and aridification as a result of glaciation. These changes may all have contributed to the progressive elimination of the once rich tropical and subtropical forests that existed towards the late Jurassic, and the establishment of extensive deserts and semi-deserts by the early Pliocene (Coetzee 1993).

Axelrod & Raven (1978) described the southern African flora as having evolved gradually since the late Cretaceous. Africa, during this time, was relatively low-lying and the climatic belts broad, supporting a lowland equatorial rainforest that reached from coast to coast. Sclerophyllous vegetation developed along the drier margins of these forests by the late Eocene. Uplift of the continent commenced during the late Oligocene-early Miocene and resulted in the formation of broad ridges and basins. The initiation of volcanism and the formation of rift valleys during this period provided further topographical diversity. Rainforest taxa started to invade the higher-lying areas which were less subject to seasonal fluctuations, whereas savannahs became more widespread under the seasonal rainfall of the lower-lying areas. When the African plate joined the Asian plate during the Miocene, the stabilizing effect of the Tethyan Sea in maintaining broad zonal climates was finally terminated. Conditions now became drier and temperatures increased in the low-lying areas. As the drier climates became more widespread, savannah, deciduous forests and sclerophyllous vegetation spread at the expense of rainforests, forcing them to higher, moister elevations. A compounding factor during this time was the introduction of cold water from Antarctica to the west coast by the Benguela Current, strengthening the trend to increased summer droughts along the west coast. The strengthening of high-pressure systems now brought drier climates to the interior restricting the spread of savannah-woodland and favouring the spread of grassland and semi-desert. The differences in the present composition of the African vegetation were accentuated largely during the Pliocene and later as dry climates spread more widely.

## Phytogeography of the southern African flora

Southern Africa in this analysis includes the countries Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. The existing flora of this region is divided into six phytogeographical regions (White 1971): the Guineo-Congolian Domain (I), the Zambezi Domain (II) which forms part of a larger Sudano-Zambezian Region, the Indian Ocean Coastal Belt Region (III) (= Usambara-Zululand Domain which forms part of the former), the Karoo-Namib (IV), the Cape (V) and the Afro-montane regions (VI) (Figure 1).

A somewhat transitional form of the Guineo-Congolian Region flora occurs in the north-western corner of Angola. This vegetation type, included in the Congo Domain by Brenan (1978), is characterized by dense forests with tall grass savannahs in between (White & Werger 1978). Vegetation of this region penetrates into the Zambezian Domain along the major river valleys and along the Angolan escarpments. The flora of this region is rich and contains many endemic taxa (Brenan 1978).

Woodlands, savannahs and grasslands of the Zambezian Domain cover almost the entire high plateau of southern Africa. They also reached the Atlantic Ocean in central Angola and spread out over the low coastal plains of Mozambique where much of the forest of the Indian Ocean Coastal Belt Region has been replaced (Werger & Coetzee 1978). The region is characterized by a strong seasonal climate. Based on savannah-woodland tree species, three regional centres of endemism, the Katanga, Barotse and Zambezi centres, have been defined (White 1965).

Scattered relics of rain forest form the Indian Ocean Coastal Belt Region vegetation. Vegetation of this type occurs in a narrow strip along the eastern seaboard of Africa from Kenya to the Eastern Cape. At least in the north, it bears a close relationship to the Guineo-Congolian Region and is often included in it as the Usambara-Zululand Domain (Brenan 1978). The floras of the northern and southern parts of the Coastal Belt Region, although part of the same continuum, are so different that two major phytochoria are recognized, the Zanzibar-Inhambane and the Tongoland-Pondoland Transitional Mosaic Regions (Moll & White 1978). The Zanzibar-Inhambane Regional Mosaic extends from near the Kenya-Somalia border in the north to the mouth of the Limpopo River in the south. It varies in width from 50 to 200 km except where it penetrates inland along certain broad river valleys.

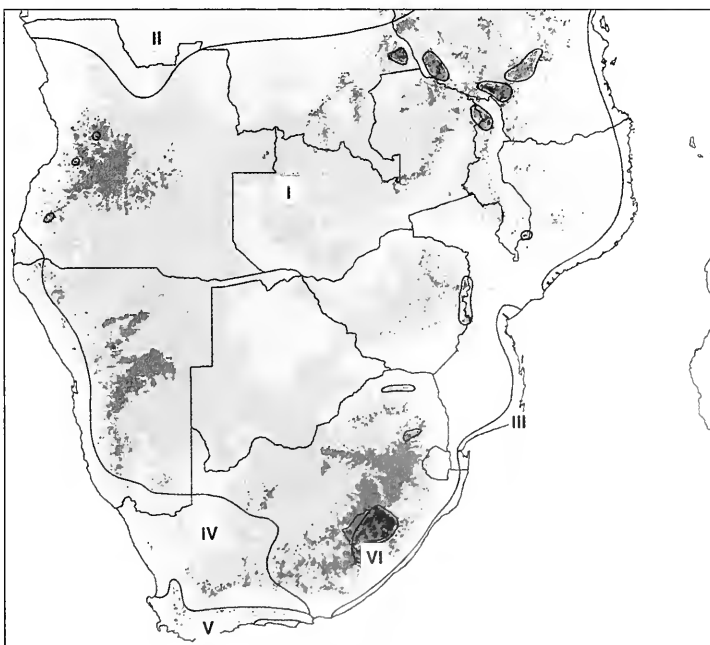


FIGURE 1: Phytogeographical regions of the southern African flora. After White (1971).

The Tongoland-Pondoland Regional Mosaic extends from the mouth of the Limpopo River to about Port Elizabeth. For most of its length, it lies below the Afromontane Region, but owing to the compensating effect of latitude many Afromontane species descending to sea level occur in it.

The Karoo-Namib Region is an extensive desert and semi-desert area in the south-western part of southern Africa, south and west of the Zambezan Domain (Werger 1978). Small woody shrubs with succulent leaves and succulents dominate the region. The climate is strongly seasonal and precipitation low. Many angiosperm genera are endemic to the region.

The Cape Region occupies a small area at the extreme south-west of the subcontinent, and has a relatively mild temperate climate with a predominantly winter rainfall. The vegetation consists mainly of sclerophyllous types (Taylor 1978). The region is remarkably rich in species and endemism is high.

The Afromontane Region (including the Afroalpine Region) comprises widely distributed 'islands' of montane flora. White (1978) divided the Afromontane archipelago into seven regional mountain systems, three of them being of relevance to this study. These are the Uluguru-Mlanje, Chimanimani and Drakensberg mountain systems. On nearly all the mountains the vegetation diminishes in stature from the lower slopes to the summit. The forests gradually giving way to scrub forest followed by bushland and thicket and ultimately to dwarf shrubland. The region is rich in endemic species.

Phytogeography of the African Pteridophyta

Africa is poor in pteridophytes when compared with other tropical areas (Tryon 1986b, 1989; Tryon & Tryon 1982b). Of the estimated 12 000 extant pteridophyte taxa South and Central America have c. 3 000 species, south-eastern Asia and adjacent islands c. 4 500 species, Africa c. 800 species and the adjacent Madagascar, an area fifty times smaller, has c. 500 species (Kornaš 1993).

About two-thirds of the African pteridophytes are limited in their occurrence to the continent (Kornaš 1993). Many of these, however, are closely related to taxa in either tropical America and/or South-east Asia. Pteridophytes of the sub-Sahara biogeographical region exhibit largely three discontinuous distribution patterns: an African-American disjunction, an African-Madagascan disjunction and an African-Asian disjunction. A small percentage of the species also have a pantropical or a cosmopolitan distribution.

Pteridophyta are well known for generally having wider distributions than the angiosperms. It has, however, been shown that matching species ranges, species disjunctions and centres of endemism in both these plant groups exist (Schelpe 1983; Tryon 1972, 1986b; Kornaš 1993). As a result of the wider distribution of most species, none of the five phytogeographical regions in the subcontinent contains a unique set of species. The Afromontane Region is by far the most species-rich area on the subcontinent followed by the Zambezan Domain and the Indian Ocean Coastal Belt Region. These three regions also have most species in common (Table 1). The arid Karoo-Namib Region is most depauperate in pteridophyte diversity, but has the highest percentage of endemic species.

Approximately 30% of the taxa occurring in the Guineo-Congolian Domain within southern Africa are restricted to it, but these taxa also occur elsewhere on the continent, especially West Africa. A large percentage of the pteridophytes occurring in this region also occur in the Zambezan Domain and the Afromontane Region. Forests within these regions may have been more widespread than what they currently are, but temperature and presumably also rainfall changes during the Quaternary resulted in them becoming isolated (Wild 1967). This floristically rich region is characterized by numerous endemics of which only *Asplenium angolense* Baker is confined to the Cuanza Norte province of Angola.

Table 1. The distribution of pteridophytes within the five major biogeographical regions of southern Africa.

GUINEO-CONGOLIAN DOMAIN (I)	100					
ZAMBEZIAN DOMAIN (II)	56	220				
INDIAN OCEAN COASTAL BELT REGION (III)	24	79	145			
KAROO-NAMIB REGION (IV)	1	9	9	25		
CAPE REGION (V)	7	38	51	19	72	
AFROMONTANE REGION (VI)	42	123	135	14	68	311
	I	II	III	IV	V	VI

The Zambezan Domain forms part of a larger Sudano-Zambezan Region. This is the largest floristic region within the subcontinent and is frequently and justifiably subdivided into several smaller centres (White 1983). Twelve taxa (5.45 %) occurring in the Zambezan Domain are endemic to it. These are *Actiniopteris dimorpha* subsp. *diversiformis*, *Asplenium chaseanum*, *A. sebungweense*, *Athyrium annae*, *Elaphoglossum rhodesianum*, *Isoetes giessii*, *Marsilea apposita*, *M. farinosa* subsp. *arrecta*, *M. unicornis*, *M. vera*, *M. villifolia* and *Selaginella subisophylla*. *Asplenium chaseanum*, *Athyrium annae*, *Elaphoglossum rhodesianum* and *Selaginella subisophylla* belong to the Katanga-Zambian Centre of endemism (Kornaš 1993).

The Indian Ocean Coastal Belt Region is divided into the Zanzibar-Inhambane and the Tongoland-Pondoland Regional Mosaics. The pteridophyte flora of the region shows a close affinity with the Afromontane Region. A single endemic, *Pyrrosia africana* is known from the Tongoland-Pondoland Regional Mosaic.

Although the arid Karoo-Namib Region has the most depauperate pteridophyte flora in southern Africa, the endemic species ratio is highest for this region. Five species, *Cheilanthes depauperata*, *C. deltoidea*, *C. kunzei*, *C. rawsonii* and *Pellaea rufa* are confined to the region. The pteridophyte flora of the region shows a close affinity with the Cape Region. When the Karoo-Namib and Cape Regions are viewed in tandem, the region may be seen as a centre of cheilanthoid fern speciation (Anthony 1985).

The Cape Region is often regarded as one of the six Floral Kingdoms of the world (Good 1974; Takhtajan 1969). In southern Africa this is the smallest of the floristic regions but the number of endemic species for the region is highest, especially in the angiosperms. The pteridophyte flora for the region is also characterized by a large percentage (12.5 %) of endemic taxa. These are *Asplenium adiantum-nigrum* var. *solidum*, *Isoetes capensis*, *I. stellenboschensis*, *I. stephanseniae*, *Mohria saxatilis*, *Ophioglossum gracile*, *Pellaea leucomelas*, *P. pteroides* and *Selaginella pygmaeum*.

The Afromontane Region in southern Africa is fragmented and has been divided into three centres of endemism, the Uluguru-Mlanje, the Chimanimani and Drakensberg Centres (White 1983). Effective barriers between these centres evidently existed since the Tertiary (Wild 1964). Twelve endemic species are known from this region of which nine are confined to the Drakensberg Centre. These include *Amauropelta knysnaensis*, *Asplenium multifforme*, *Dryopteris dracomontana*, *D. esterhuyseniae*, *Elaphoglossum drakensbergense*, *Isoetes transvaalensis*, *Polystichum dracomontanum*, *P. incongruum* and *P. macleae*, whereas *Asplenium mossambicense*, *A. schelpei* and *Christella buchananii* are shared by the Chimanimani and Drakensberg centres. Pteridophyta of the Afromontane Region shows the greatest affinity with the Indian Ocean Coastal Belt Region and the Zambezian Domain.

The Marion and Prince Edward Island group forms a phytogeographical area completely different from any of the foregoing. This island group is of volcanic origin and estimated to be 0.5 million years old (Verwoerd 1971). Situated in the Southern Ocean some 1 800 km from Africa, its biota consists of taxa capable of long-distance dispersal and the ability to establish themselves in habitats not always favourable for plant growth. Most taxa occurring on the islands have wide distributions with only *Hymenophyllum peltatum* occurring on the African subcontinent. Only *Elaphoglossum randii* is endemic to the island group, whereas the distribution of *Polystichum marionense* extends to the Crozet Islands.

# LIST OF FAMILIES AND GENERA

Division Pteridophyta

Class Psilotopsida

Subclass Psilotidae

Order Psilotales

Psilotaceae

**Psilotum**

Class Equisetopsida

Order Equisetales

Equisetaceae

**Equisetum**

Class Lycopodiopsida

Order Lycopodiales

Lycopodiaceae

**Huperzia**

**Lycopodium**

**Lycopodiella**

Order Selaginellales

Selaginellaceae

**Selaginella**

Order Isoetales

Isoetaceae

**Isoetes**

Class Filicopsida

Order Ophioglossales

Ophioglossaceae

**Ophioglossum**

Order Marattiales

Marattiaceae

**Marattia**

Order Polypodiales

Suborder Polypodiineae

Osmundaceae

**Osmunda**

**Todea**

Gleicheniaceae

Gleichenioideae

**Gleichenia**

**Dicranopteris**

Hymenophyllaceae

Hymenophylloideae

**Hymenophyllum**

**Sphaerocionium**

**Crepidomanes**

**Trichomanes**

**Cephalomanes**

Schizaeaceae

**Schizaea**

Lygodiaceae

**Lygodium**

Anemiaceae

**Anemia**

**Mohria**

Parkeriaceae

**Ceratopteris**

Pteridaceae

Taenitidoideae

**Pityrogramma**

**Anogramma**

**Actiniopteris**

Cheilanthes

**Cheilanthes**

**Aleuritopteris**

**Pellaea**

**Doryopteris**

**Coniogramme**

Adiantaceae

**Adiantum**

Pteridoideae

**Pteris**

**Acrostichum**

Vittariaceae

**Antrophyum**

**Vittaria**

Dicksoniaceae

**Dicksonia**

Cyatheaceae

**Cyathea**

Dennstaedtiaceae

Dennstaedtioidae

**Microlepia**

Paesioideae

Pteridiinae

**Pteridium**

Hypolepidae

**Hypolepis**

Histiopteridae

**Blotiella**

**Histiopteris**

Lindsaeaceae

**Lonchitis**

**Odontosoria**

**Lindsaea**

Polypodiaceae

Platycerioideae

**Platycerium**

**Pyrrosia**

Polypodioideae

Drynariaceae

**Drynaria**

Microsoreae

**Belvisia**

**Lepisorus**

**Microsorium**

Polypodieae

**Polypodium**

**Microgramma**

**Pleopeltis**

**X Pleopodium**

Loxogrammeae

**Loxogramme**

Grammitidaceae

**Melpomene**

**Lellingeria**

**Grammitis**

**Cochlidium**

**Terpsichore**

**Zygophlebia**

Davalliaceae

**Davallia**

Nephrolepidaceae

**Nephrolepis**

Thelypteridaceae

**Ampelopteris**

**Macrothelypteris**

**Cyclosorus**

**Pseudocyclosorus**

**Amauropelta**

**Thelypteris**

**Stegnogramma**

**Pneumatopteris**

**Christella**

**Amphineuron**

**Menisorus**

Dryopteridaceae

**Rumohra**

**Nothoperanema**

**Dryopteris**

**Arachniodes**

**Polystichum**

**Cyrtomium**

**Didymochlaena**

Tectariaceae

**Tectaria**

**Triplophyllum**

**Ctenitis**

**Megalastrum**

**Lastreopsis**

Woodsiaceae

**Athyrium**

**Diplazium**

**Deparia**

**Cystopteris**

**Hypodematum**

**Woodsia**

Oleandraceae

**Oleandra**

**Arthropteris**

Lomariopsidaceae

**Lomariopsis**

**Bolbitis**

**Elaphoglossum**

Blechnaceae

Blechnoideae

**Doodia**

**Blechnum**

Stenochlaenoideae

**Stenochlaena**

Aspleniaceae

**Asplenium**

Suborder Marsileineae

Marsileaceae

**Marsilea**

Suborder Salviniineae

Salviniaaceae

**Salvinia**

Azollaceae

**Azolla**

# TAXONOMY

## Key to the families:

- 1a Leaves simple with an unbranched central vein:
  - 2a Sporangia borne on peltate sporangiophores arranged in a terminal strobilus ..... 2. **Equisetaceae**
  - 2b Sporangia borne in the axils of sporophylls or adaxially near the leaf bases:
    - 3a Plants homosporous; leaves without ligules:
      - 4a Two or three sporangia fused to form a synangium ..... 1. **Psilotaceae**
      - 4b Sporangia solitary ..... 3. **Lycopodiaceae**
    - 3b Plants heterosporous; leaves with ligules:
      - 5a Wholly or partially aquatic plants during the wet season; stem short ..... 5. **Isoetaceae**
      - 5b Plants not aquatic; stems long, erect or creeping ..... 4. **Selaginellaceae**
- 1b Fronds simple or compound with a branched vascular system:
  - 6a Sporangia fused to form a synangium:
    - 7a Synangia borne dorsally on the veins on the abaxial surface of the lamina; stem massive ..... 7. **Marattiaceae**
    - 7b Synangia two, elongate, borne at the apex of a spike inserted at the base of the sterile lamina; stem small and subterranean ..... 6. **Ophioglossaceae**
  - 6b Sporangia borne singly or in sori but never fused:
    - 8a Plants heterosporous; sporangia heteromorphic:
      - 9a Plants rooted; fronds with 4 leaflets borne apically ..... 33. **Marsileaceae**
      - 9b Plants free floating:
        - 10a Leaves borne in whorls, 2 floating, other submerged and root-like; true roots absent ..... 34. **Salviniaceae**
        - 10b Leaves not in whorls, bilobed; true roots present ..... 35. **Azollaceae**
    - 8b Plants homosporous; sporangia isomorphic:
      - 11a Sporangia sessile or subsessile, or with a short stalk 4 or more cells thick:
        - 12a Sporangia with a poorly developed lateral annulus ..... 8. **Osmundaceae**
        - 12b Sporangia with a well developed apical or subapical annulus:
          - 13a Fronds climbing ..... 12. **Lygodiaceae**
          - 13b Fronds not climbing:
            - 14a Sori indusiate:
              - 15a Indumentum primarily composed of paleae; sori occur dorsally on the veins; indusia inferior ..... 18. **Cyatheaceae**
              - 15b Indumentum composed of uniseriate hairs only; sori marginal; abaxial indusia open towards the margin ..... 17. **Dicksoniaceae**
            - 14b Sori exindusiate:
              - 16a Sporangia borne on small fertile pinnae arranged at the apex of a narrow, linear frond ..... 11. **Schizaeaceae**
              - 16b Sporangia borne at or near the vein apices on differentiated or undifferentiated fertile parts of the lamina ..... 13. **Anemiaceae**
      - 11b Sporangia borne on a short or long slender stalk, 3 or fewer cells thick:
        - 17a Fronds pseudo-dichotomously branched, with an arrested bud between the branchlets ..... 9. **Gleicheniaceae**
        - 17b Fronds simple or pinnately compound:
          - 18a Lamina unistratose; without stomata ..... 10. **Hymenophyllaceae**
          - 18b Lamina multistratose; generally with stomata:
            - 19a All, or at least the fertile fronds articulated at the stipe base:
              - 20a Sporangia acrostichoid; fronds dimorphic:
                - 21a Sterile fronds not articulated, the fronds highly dimorphic ..... 21. **Polypodiaceae** (*Platyserium*)
                - 21b Sterile and fertile fronds articulated at the stipe base; lamina simple:
                  - 22a Coenosori confined to the apical region of the lamina ..... 21. **Polypodiaceae** (*Belvisia*)
                  - 22b Sporangia cover the entire abaxial surface of the fertile lamina ..... 30. **Lomariopsidaceae** (*Elaphoglossum*)
              - 20b Sporangia not acrostichoid; fronds monomorphic or dimorphic:
                - 23a Sori borne in the fork of a vein ..... 23. **Davalliaceae**
                - 23b Sori borne dorsally on the veins:
                  - 24a Sori indusiate; veins free ..... 29. **Oleandraceae**
                  - 24b Sori exindusiate; veins anastomosing ..... 21. **Polypodiaceae**
          - 19b Fronds not articulated at the stipe base:
            - 25a Pinnae articulated along the rachis:
              - 26a Sori superficial ..... 24. **Nephrolepidaceae**
              - 26b Sori marginal ..... 15. **Pteridaceae** (*Pellaea*)
            - 25b Pinnae not articulated along the rachis:
              - 27a Rhizome paleae clathrate; stipe with two outward facing vascular bundles:
                - 28a Indusium absent; lamina entire ..... 16. **Vittariaceae**
                - 28b Indusium present, if absent then the lamina pinnate ..... 32. **Aspleniaceae**
              - 27b Rhizome paleae concolorous, if clathrate then the stipe with 2 or more inward facing vascular bundles:
                - 29a Sori elongate, in a single (often interrupted) row on each side of the costae; indusia open towards the costae ..... 31. **Blechnaceae**
                - 29b Sori round to linear or sporangia acrostichoid, indusiate or exindusiate:
                  - 30a Sori exindusiate:
                    - 31a Sporangia acrostichoid or arranged along free or anastomosing veins:

- 32a Sporangia arranged along free or anastomosing veins ..... 15. **Pteridaceae** (*Taenitidoideae*)
- 32b Sporangia acrostichoid:
  - 33a Venation free ..... 30. **Lomariopsidaceae** (*Lomariopsis*)
  - 33b Venation reticulate:
    - 34a Sporangia intermixed with paraphyses ..... 15. **Pteridaceae** (*Acrostichum*)
    - 34b Paraphyses absent ..... 30. **Lomariopsidaceae** (*Bolbitis*)
- 31b Sporangia arranged in distinct sori:
  - 35a Fronds simple or pinnatifid ..... 22. **Grammitidaceae**
  - 35b Fronds pinnately compound:
    - 36a Indumentum mostly composed of acicular hairs .....
      - ..... 25. **Thelypteridaceae** (*Ampelopteris*, *Stegnogramma*, *Pneumatopteris*, *Menisorus*)
    - 36b Indumentum mostly composed of scales ..... 26. **Dryopteridaceae** (*Polystichum*)
- 30b Sori indusiate, indusium superficial or covered by a reflexed (often strongly modified) lamina margin:
  - 37a Sori marginal or near marginal, borne at a vein ending or along a vascular commisure; indusium cup-shaped or a reflexed (often strongly modified) margin:
    - 38a Free floating aquatic herbs ..... 14. **Parkeriaceae**
    - 38b Terrestrial herbs:
      - 39a Indusia open towards the margin ..... 20. **Lindsaeaceae**
      - 39b Indusia open towards the costae:
        - 40a Indumentum primarily composed of acicular hairs ..... 19. **Dennstaedtiaceae**
        - 40b Indumentum primarily composed of paleae, if hairs predominate then never acicular ..... 15. **Pteridaceae**
  - 37b Sori superficial, dorsally, at or near the apex of an abbreviated or unabbreviated vein branch:
    - 41a Sori linear, straight or curved; indusia attached marginally .....
      - ..... 25. **Woodsiaceae** (*Athyrium*, *Diplazium*, *Deparia* sect. *Athyriopsis*)
    - 41b Sori oval or circular; indusia reniform, peltate or centrally along a line:
      - 42a Stipe base with 2 strap-shaped vascular bundles ..... 28. **Woodsiaceae**
      - 42b Stipe base with 2 or more near circular vascular bundles:
        - 43a Stipe base with 2 vascular bundles ..... 25. **Thelypteridaceae**
        - 43b Stipe base with several vascular bundles:
          - 44a Frond indumentum largely composed of paleae ..... 26. **Dryopteridaceae**
          - 44b Frond indumentum largely composed of hairs ..... 27. **Tectariaceae**

## Division PTERIDOPHYTA

### Class PSILOTOPSIDA

#### Subclass PSILOTIDAE

Order PSILOTALES Engl., Syllabus der Vorlesungen über specielle und medicinisch-pharmaceutische Botanik: 58 (1892a).

#### 1. **PSILOACEAE** Kanitz, A Növényrendszer Áttekintése: 43 (1887). Type: *Psilotum* Sw.

Plants epiphytic or epilithic perennials. *Stems* protostelic or solenostelic, subterranean, dichotomously or laterally branched, with endophytic mycorrhiza, without roots, with short and long rhizoids; aerial stems chlorophyllous, erect or pendulous, dichotomously branched, glabrous, angular or sulcate; with anomocytic stomata in the sulci. *Leaves* rudimentary, simple, estomate. *Sporangia* fused to form a sessile, 2- or 3-locular, thick-walled synangium adaxially at the base of forked sporophylls, each locule dehisces with a longitudinal slit. *Spores* numerous, achlorophyllous, elongate-ellipsoid, monolete, irregularly rugate, 60–75 µm long. *Gametophyte* subterranean, achlorophyllous, mycotrophic, near cylindrical, often branched; antheridia and archegonia borne diffusely and in large numbers all over the surface; antheridium with a 1-layered wall of many cells and an opercular cell; spermatozoids multiciliate; archegonia sunken, neck short and thick. Chromosome number based on  $2n = 104$ .

A family of two genera, *Tmesipteris* Bernh. being confined to tropical Asia and western Oceania, and *Psilotum* Sw., which has a pantropical distribution. The family shows no close affinity to other groups of vascular plants and is best treated as an independent assemblage. *Psilotum* is often grouped with the extinct psilophytes, the Rhyniales and Zosterophyllales dating from the Late Silurian. These plants are all characterized by dichotomously branched stems, the absence of roots, a relatively simple vascular structure and thick-walled, homosporous synangia. The earliest known fossil record for the family is a *Tmesipteris* specimen that dates back to the early Oligocene (Carpenter et al. 1994).

**0110100 PSILOTUM** Sw. in Journal für die Botanik 1800, 2: 8, 109 (1801). Type: *Psilotum triquetrum* Sw., nom. superfl. (now *Psilotum nudum* (L.) P.Beauv.; *Lycopodium nudum* L.).

Generic description as for the family.

Although several species have been described only two may be distinct, one occurring on the African subcontinent.

**Psilotum nudum** (L.) P.Beauv., Prodrôme des cinquième et sixième familles de l'Aéthéogamie: 112 (1805); Schelpe: 15 (1970); Schelpe: 17 (1977); Schelpe & Diniz: 9 (1979); Jacobsen: 30 (1983); Schelpe & Anthony: 1 (1986); Burrows: 10 (1990). *Lycopodium nudum* L.: 1100 (1753). Type: In Indiis, sine coll. s.n. [LINN 1257.1!, lecto., designated by Proctor (1977)].

*Psilotum triquetrum* Sw.: 109 (1801), nom. superfl. for *Lycopodium nudum* L., now *Psilotum nudum* (L.) P.Beauv., Sim: 247 (1892); Sim: 342 (1915).

*Bernhardia capensis* Müll.Berol.: 238, 239 (1856). Type: Natal, Pappe s.n. (?KR, holo.).

ILLUSTRATION: Schelpe: t. 2, fig. 1, 2 (1970).

Epilithic or epiphytic in permanently or seasonally moist forested and montane environments, from near sea-level to 1 950 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Kenya, Lesotho, Liberia, Malawi, Mozambique, Nigeria, Pemba, São Tomé, Senegal, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region, Asia, Polynesia, Australasia, the Americas, Cape Verde Islands and southern Spain.

### Class EQUISETOPSIDA

Order EQUISETALES *Dumort.*, Analyse des familles des plantes: 66 (1829), as 'Equisetarieae'.

#### 2. EQUISETACEAE *Rich. ex DC.*, Flore française, 3rd edn, 2: 580 (1805). Type: *Equisetum* L.

Plants terrestrial perennials. *Stems* siphonostelic, subterranean stems rhizomatic, jointed; roots borne in whorls at the nodes; aerial stems chlorophyllous, erect, the branches (mostly) borne in whorls at the nodes, ridged, bearing siliceous tubercles or bands, with regular rows of paracytic sunken stomata in the sulci, in cross section with a prominent central canal and small vallicular (under sinuses) and carinal (under ridges) canals. *Leaves* small, each with a single vein, whorled, fused into a nodal sheath; estomate. *Sporangia* elongate, thin-walled, dehiscing longitudinally, borne on stalked, peltate sporangiophores forming a strobilus terminally on a vegetative stem or branch, each sporangiophore bears 6–9 sporangia. Spores spheroidal, chlorophyllous, with 4 spathulate hygroscopic elaters. *Gametophyte* chlorophyllous, epigeal, irregularly thallose, branched; antheridia borne on lobes, sometimes unisexual or gametangia functionally so; archegonia mostly borne on the thickened portion. Chromosome number based on  $2n = 216$ .

A well-defined monogeneric group of extinct and extant plants not related to any other group of pteridophytes. The group dates back to the Permian. All extant species are herbaceous with *Equisetum giganteum* L., a native of Equador, having stems that may attain a height of up to 8 m. *Equisetum*, also called scouring rushes or horsetails, accumulates large quantities of silica in the epidermal cell walls of the aerial shoots where it has a strengthening function. *Equisetum* is of economic importance to the stock farmer as it is poisonous when consumed in large quantities, the toxic principle probably being the enzyme thiaminase that destroys vitamin B1 (Pohl 1955).

**0111100 EQUISETUM** L., Species plantarum 2: 1061 (1753). Lectotype: *Equisetum fluviatile* L., designated by Hauke (1978).

Generic description as for the family.

A near cosmopolitan genus of about 15 species most of which occur in America. The genus is absent from Australia and New Zealand. Two subgenera are recognized each with several sections (Hauke 1963; 1978).

#### KEY TO THE SUBGENERA:

Aerial stems mostly evergreen; stomata in long regular rows, sunken; strobili usually apiculate ..... subgen. **Hippochaete**  
Aerial stems deciduous; stomata irregularly disposed in broad bands, superficial; strobili blunt ..... subgen. **Equisetum**

Subgenus **Hippochaete** (*Milde*) *Baker*, Handbook of the fern-allies: 3 (1887a). *Hippochaete* *Milde*: 297 (1865). *Equisetum* L. sect. *Hippochaete* (*Milde*) *Milde*: 230 (1867). Type: *Equisetum hyemale* L.

Subgenus *Hippochaete* is divided into three sections. Section *Ambigua* is characterized by evergreen or deciduous branched or unbranched aerial stems, with stomata that are arranged in one or several lines, and ridges that are convex.

Section **Ambigua** (*Farw.*) *Hauke* in American Fern Journal 52: 30 (1962). *Hippochaete* *Milde* sect. *Ambigua* *Farw.*: 464 (1916). Type: *Equisetum laevigatum* A. Braun

**Equisetum ramosissimum** *Desf.*, Flora atlantica 2: 398 (1799); *Sim*: 240 (1892); *Sim*: 343 (1915); *Schelpe*: 32 (1970); *Schelpe*: 32 (1977); *Schelpe & Diniz*: 28 (1979); *Jacobsen*: 158 (1983); *Schelpe & Anthony*: 29 (1986); *Burrows*: 37 (1990). *Hippochaete ramosissimum* (*Desf.*) *Börner*: 282 (1912). Type: Tunisia, Jebel Zaghouan, *Desfontaines* s.n. (P, holo.).

*Equisetum thunbergii* *Wikstr.*: 4 (1821). Type: Cape Province, *Thunberg* s.n. (UPS, holo.).

*Equisetum burchellii* *Vaucher*: 47, t. 10 (1822). *Equisetum ramosissimum* *Desf.* var. *burchellii* (*Vaucher*) *Milde*: 443 (1865). Type: Africa australis extratropica, n. 2464, *Burchell* s.n. (K, iso.).

*Equisetum ramosissimum* *Desf.* var. *capense* *Milde*: 442 (1865). Type: Promont. bonae Spei, 1844, *Drège & Zeyher* s.n. (missing).

*Equisetum ramosissimum* *Desf.* var. *dregeanum* *Milde*: 447 (1865). Type: Promont. bonae Spei, *Drège* s.n., *Thunberg* s.n. (UPS, holo.).

*Equisetum ramosissimum* *Desf.* var. *arcuatum* *Milde*: 448 (1865). Type: Promont. bonae Spei, ad rivum parvum prope Gekan, *Drège* s.n. (LZ<sup>†</sup>).

*Equisetum ramosissimum* *Desf.* var. *flagelliferum* *Milde*: 449 (1865). Type: Ad margines aqueductum urbis Palmarum et alibi insulae Teneriffa, sine coll. s.n. (not located); Natal, in palud. ripae Togela fluvii, *Gueinzus* s.n. (W, syn.).

*Equisetum ramosissimum* *Desf.* var. *distortum* *Milde*: 451 (1865). Type: Promontorium bonae Spei, *Mundt & Maire* s.n. (missing).

*Equisetum ramosissimum* *Desf.* var. *natalense* *Milde*: 452 (1865). Type: Natal-Küste, *Gueinzus* s.n. (missing).

subsp. **ramosissimum**

ILLUSTRATION: Schelpe: t. 7, fig. 1, 2 (1970).

In permanently moist soil along perennial streams and rivers, in riverine forests and scrub, or in the open, often invasive in cultivated fields, 100–1 700 m.

**DISTRIBUTION:** Angola, Botswana, Burundi, Democratic Republic of the Congo, Egypt, Kenya, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zanzibar and Zimbabwe. Also in the Madagascan region, Macaronesia, southern and central Europe and Asia, except Malaysia.

subsp. **debile** (Roxb. ex Vaucher) Hauke occurs from India and southern China, through Malaysia to New Caledonia and Fiji.

### Class LYCOPODIOPSIDA

Order LYCOPODIALES Dumort., Analyse des familles des plantes: 67 (1829), as 'Lycopodiariae'.

3. **LYCOPODIACEAE** P.Beauv. ex Mirb., Histoire naturelle des végétaux, classés par familles 4: 293 (1803b). Type: *Lycopodium* L.

*Urostachyaceae* Rothm.: 58 (1944), nom. illeg. Type: *Urostachys* Herter, nom. illeg.

*Huperziaceae* Rothm.: 236 (1962). Type: *Huperzia* Bernh.

Plants terrestrial, epilithic, or epiphytic perennials. Stems protostelic, xylem arranged radially (actinostelic) or in parallel bands (plectostelic), erect, pendent, or creeping, dichotomously branched, isotomous or anisotomous, isophyllous or anisophyllous, homophyllous or heterophyllous, bearing a few fleshy dichotomously branched roots in a basal tuft, or irregularly along a creeping main stem. Leaves herbaceous to coriaceous, simple, with a simple central vein, arranged in alternating spirals or in irregular whorls; epistomatic or amphistomatic, stomata of the anomocytic type; sporophylls sometimes specialized and arranged into distinct strobili. *Sporangia* solitary, reniform to subglobose, sessile or short-stalked, thick-walled, axillary or adaxially at the base of the sporophyll, dehiscing by a transverse slit, isovalvate or anisovalvate; epidermal cells with sinuate anticlinal walls, often lignified. Spores numerous, without chlorophyll, trilete, subglobose, with a hemispherical distal face, fossulate, foveolate, reticulate, or rugate, 20–60 µm in diameter. *Gametophyte* epigeal, with a mycotrophic tuber and non-mycotrophic chlorophyll bearing lobes, or subterranean and then without chlorophyll and holosaprophytic; antheridia superficial, borne apart from archegonia, archegonia sunken. Chromosome number variable, based on  $2n = 46, 68, 78, 136, 208$  and  $272$ , no base number evident.

A family with a near cosmopolitan distribution. The lycopods are an ancient line of plants well established during the Devonian (Collinson 1996), with many species having attained arborescent dimensions during the Carboniferous period. The extant species number more than 400. The classification proposed by Øllgaard (1987) is followed here.

#### KEY TO THE GENERA:

- 1a Stems isotomously branched, without elongate indeterminate main stems; roots usually forming a basal tuft; sporophylls and vegetative leaves alike, or the sporophylls, if smaller, persistent ..... 0112000 **Huperzia**
- 1b Stems anisotomously branched, branches differentiated into elongate, indeterminate main stems and determinate branchlet systems; roots emerging at intervals on the lower side of the main stem; sporophylls strongly modified and ephemeral:
  - 2a Strobili pendent and sessile, or erect and ending in simple (rarely branched) stems that arise dorsally on the creeping stems, or the strobili erect on the overtopping vegetative shoots; sporangium epidermal cells straight ..... 0112300 **Lycopodiella**
  - 2b Strobili erect, pedunculate, borne terminally or on branchlet stems which arise in a dorso-lateral position on the main stem; sporangium epidermal cells sinuate ..... 0112200 **Lycopodium**

**0112000 HUPERZIA** Bernh. in Journal für die Botanik 1800, 2: 126 (1801). Lectotype: *Huperzia selago* (L.) Bernh. ex Schrank & Mart.; *Lycopodium selago* L., designated by Rothmaler (1944).

Plants terrestrial, epilithic, or epiphytic perennials. Stems with a basal tuft of roots, erect or pendent, isotomously branched, isophyllous, homophyllous or heterophyllous. Leaves herbaceous to coriaceous; sporophylls gradually or abruptly smaller than the vegetative leaves, persistent. Strobili not or poorly developed. *Sporangia* reniform, isovalvate, short-stalked, axillary, epidermal cell walls sinuate. Spores trilete, subglobose to subtriangular, fossulate or foveolate, 20–60 µm in diameter. *Gametophyte* cylindrical, with a radial or bilateral symmetry, subterranean, holosaprophytic, with pluricellular hairs among the gametangia. Chromosome number based on  $2n = 272$ .

A genus of 200 to 300 species with a near cosmopolitan distribution. Øllgaard (1987) provides an informal classification of the genus dividing it into 22 species groups. A study by Wikström *et al.* (1999), however, shows that several of these groups are either polyphyletic, paraphyletic or poorly supported, whereas others contain monophyletic elements. Holub (1991) also gives a contribution to the subgeneric classification of the genus.

#### KEY TO THE SPECIES:

- 1a Plants homophyllous, never forming distinct strobili:
  - 2a Leaves firmly herbaceous, acicular to subulate ..... 8. **H. verticillata**
  - 2b Leaves coriaceous:
    - 3a Stems pendulous ..... 1. **H. dacyrioides**
    - 3b Stems erect:
      - 4a Stems unbranched ..... 7. **H. saururus**
      - 4b Stems branched ..... 6. **H. insularis**
- 1b Plants heterophyllous, sporophylls gradually or abruptly reduced:
  - 5a Sporophylls gradually reduced:
    - 6a Leaves coriaceous ..... 2. **H. gnidioides**



- 6b Leaves firmly herbaceous ..... 3. **H. ophioglossoides**  
 5b Sporophylls abruptly reduced:  
 7a Sporophylls longer than the sporangia ..... 5. **H. staudtii**  
 7b Sporophylls and sporangia subequal in length ..... 4. **H. phlegmaria**

Gnidioides group: Terrestrial or epilithic; stems robust, erect or pendent; shoots homophyllous or the sporophylls gradually reduced, coriaceous. Africa and Madagascar.

1. **Huperzia dacrydioides** (Baker) Pic.Serm. in Webbia 23: 162 (1968a). *Lycopodium dacrydioides* Baker: 17 (1887a); Sim: 327 (1915); Schelpe: 18 (1970); Schelpe & Diniz: 12 (1979); Jacobsen: 134 (1983); Schelpe & Anthony: 7 (1986); Burrows: 14 (1990). *Urostachys dacrydioides* (Baker) Herter ex Nessel: 188 (1939). Type: Natal, *Buchanan s.n.* [K, lecto., designated by Pichi Sermolli (1968a)].

ILLUSTRATION: Schelpe & Anthony: t. 3, fig. 3, 3a (1986).

Epilithic or epiphytic, in moist montane forests, deeply shaded, 1 400–2 450 m.

DISTRIBUTION: Burundi, Ethiopia, Kenya, Malawi, Mozambique, South Africa, Tanzania, Uganda and Zimbabwe.

2. **Huperzia gnidioides** (L.f.) Trevis. in Atti della Società Italiana di Scienze Naturali 17: 247 (1875). *Lycopodium gnidioides* L.f.: 448 (1782); Sim: 243 (1892); Sim: 326 (1915); Schelpe: 18 (1970); Schelpe & Diniz: 13 (1979); Jacobsen: 135 (1983); Schelpe & Anthony: 9 (1986); Burrows: 14 (1990). *Plananthus gnidioides* (L.f.) P.Beauv.: 110 (1805). *Urostachys gnidioides* (L.f.) Herter ex Nessel: 187 (1939). Type: Isle de France, *Sonnerat per Thouin s.n.* (?P, ?iso.).

*Lycopodium funiculosum* Lam.: 649 (1792). *Lepidotis funiculosa* (Lam.) P.Beauv.: 108 (1805). Type: Cap. b. esp., *sine coll. s.n.* (Pl, holo.).

*Lycopodium flagelliforme* Schrad.: 920 (1818). Type: Prom. bon. spei, *Hesse s.n.* (LE, holo.; GOET, iso.).

*Lycopodium ambiguum* Schrad.: 920 (1818). Type: Prom. bon. spei, *Hesse s.n.* (LE, holo.).

*Lycopodium pinifolium* Kaulf.: 7 (1824). *Lycopodium gnidioides* L.f. var. *pinifolium* (Kaulf.) Pappe & Raws.: 49 (1858); Jacobsen: 136 (1983). Type: Promontorio bonae spei, *sine coll. s.n.* (?PH, holo.).

ILLUSTRATION: Schelpe & Anthony: t. 3, fig. 1, 1a, 2, 2a (1986).

Epilithic in montane habitats, or epiphytic in moist montane forests, exposed or lightly shaded, 700–1 750 m.

DISTRIBUTION: Burundi, Democratic Republic of the Congo, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Tanzania and Zimbabwe. Also in the Madagascan region.

Phlegmaria group: Epiphytic; stems pendent, with strongly differentiated heterophyllous shoots, terminal divisions with short decussate imbricate leaves. Pantropical.

3. **Huperzia ophioglossoides** (Lam.) Rothm. in Feddes Repertorium Specierum Novarum Regni Vegetabilis 54: 62 (1944). *Lycopodium ophioglossoides* Lam.: 646 (1792); Schelpe: 18 (1970); Schelpe & Diniz: 13 (1979); Jacobsen: 137 (1983); Schelpe & Anthony: 9 (1986); Burrows: 16 (1990). *Urostachys ophioglossoides* (Lam.) Herter ex Nessel: 238 (1939). Type: Ile de France, *Commerson s.n.* (P-LA!, holo.).

ILLUSTRATION: Fig. 2A & B; Schelpe: t. 3, fig. 1, 2 (1970).

Epilithic or epiphytic, in moist montane forests, mostly deeply shaded, 1 400–1 800 m.

DISTRIBUTION: Annobon, Bioko, Cameroon, Comoro Isl., Congo, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Kenya, Malawi, Mozambique, Réunion, São Tomé, South Africa, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

4. **Huperzia phlegmaria** (L.) Rothm. in Feddes Repertorium Specierum Novarum Regni Vegetabilis 54: 62 (1944). *Lycopodium phlegmaria* L.: 1101 (1753); Schelpe: 20 (1970). *Lepidotis phlegmaria* (L.) P.Beauv.: 109 (1805). *Phlegmarius phlegmaria* (L.) T.Sen & U.Sen: 421 (1978). *Urostachys phlegmaria* (L.) Herter: 17 (1923b). Type: In Malabar, Zeylona. Several collateral references cited. Dillenius, J.J. *Historia muscorum* t. 61, fig. 5A, B, C (1741) is eligible as lectotype.

ILLUSTRATION: Chinnock: fig. 43 K–L (1998).

Epilithic or epiphytic, in moist montane forests, deeply shaded, 1 400–1 800 m.

DISTRIBUTION: Bioko, Cameroon, Equatorial Guinea, Gabon, Guinea, Malawi, Príncipe, São Tomé, Tanzania and Uganda. Also in Asia, the Pacific and Australia.

5. **Huperzia staudtii** (Nessel) Pic.Serm. in Webbia 23: 163 (1968a). *Urostachys staudtii* Nessel: 189, t. 175 (1934). *Lycopodium staudtii* (Nessel) Adams & Alston: 183 (1955); Schelpe: 19 (1977). Type: Kamerun, Johann Albrechts Höhe, *Staudt 476* [P, lecto., designated by Nessel (1939); BONN, Nessel 556, p.p. isolecto.].

ILLUSTRATION: Tardieu-Blot: t. 5, fig. 4–8 (1964b).

Epiphytic in moist montane forests, upper canopy.

DISTRIBUTION: Angola, Cameroon, Central African Republic, Coté d'Ivoire, Gabon, Ghana and Nigeria.



FIGURE 2A–I, Lycopodiaceae and Selaginellaceae. A & B, *Huperzia ophioglossoides*, A, habit, B, sporophyll, Van Jaarsveld 6095 (NBG); C & D, *Lycopodium zandophyllum*, C, habit, D, sporophyll, Vlok 1376 (NBG); E, *Selaginella mittenii* strobilus, Roux 670 (NBG); F–I, *Selaginella cafferorum*, F, strobilus; G, leaf; H, abaxial surface of the sporophyll; I, adaxial surface of the sporophyll, Roux 1293 (NBG). Scale bars: A, C, 10 mm; B, 1 mm; D, E, 1 mm; F, 1 mm; G–I, 1 mm.

Saururus group: Terrestrial or epilithic; stems erect, homophyllous; leaves closely imbricate, coriaceous. In alpine vegetation of South and Central America, Africa and the Southern Ocean islands.

6. **Huperzia insularis** (Carmich.) Rothm. in Feddes Repertorium Specierum Novarum Regni Vegetabilis 54: 60 (1944). *Lycopodium insulare* Carmich.: 509 (1818). *Urostachys insularis* (Carmich.) Herter ex Nessel: 64 (1939), nom. inval. Type: Cliffs of Tristan d'Acunha, Carmichael s.n. (K, lecto., designated by Nessel (1939); BM, BONN, Nessel 136 p.p., isolecto.).

Epilithic, in crevices of exposed rock outcrops, 20–250 m.

**DISTRIBUTION:** Marion Island. Also in S. America and the South Atlantic islands.

7. **Huperzia saururus** (Lam.) Trevis. in Atti della Società Italiana di Scienze Naturali 17: 249 (1875). *Lycopodium saururus* Lam.: 653 (1792); Sim: 242 (1892); Sim: 324 (1915); Schelpe: 17 (1970); Jacobsen: 132 (1983); Schelpe & Anthony: 5 (1986); Burrows: 12 (1990). *Plananthus saururus* (Lam.) P.Beauv.: 111 (1805). *Urostachys saururus* (Lam.) Herter: 162 (1923a). Type: Ile de Bourbon, Commerson s.n. (P-LA!, holo.).

**ILLUSTRATION:** Schelpe & Anthony: t. 2, fig. 1, 1a (1986).

Terrestrial or epilithic, generally on low cliffs or among rocks in seasonally moist montane grasslands above 1 700 m.

**DISTRIBUTION:** Cameroon, Democratic Republic of the Congo, Kenya, Lesotho, Malawi, Rwanda, South Africa, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

Verticillata group: Epilithic or epiphytic; stems delicate and pendent, homophyllous; leaves acicular to subulate. Pantropical.

8. **Huperzia verticillata** (L.f.) Trevis. in Atti della Società Italiana di Scienze Naturali 17: 248 (1875). *Lycopodium verticillatum* L.f.: 448 (1782); Sim: 325 (1915); Schelpe: 17 (1970); Schelpe & Diniz: 12 (1979); Jacobsen: 133 (1983); Schelpe & Anthony: 7 (1986); Burrows: 12 (1990). *Plananthus verticillatus* (L.f.) P.Beauv.: 112 (1805). *Stachygynandrum verticillatum* (L.f.) P.Beauv.: 113 (1805). *Urostachys verticillatus* (L.f.) Herter: 249 (1922). Type: Insulae de Bourbon, Sonnerat per Thouin s.n. (SBT, holo.).

**ILLUSTRATION:** Schelpe & Anthony: t. 4, fig. 2, 2a (1986).

Epilithic or epiphytic, in moist or seasonally moist montane forests, mostly deeply shaded, 1 400–1 900 m.

**DISTRIBUTION:** Bioko, Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Kenya, Lesotho, Malawi, Mozambique, Rwanda, São Tomé, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region, tropical America, and Polynesia.

**0112200 LYCOPODIUM** L., Species plantarum 2: 1100 (1753), emend. Roth.: 63 (1944). Lectotype: *Lycopodium clavatum* L., designated by Britton & Brown (1913).

*Lepidotis* Mirb.: 477 (1802). Type: *Lycopodium clavatum* L.

*Diphasium* C.Presl ex Rothm.: 64 (1944). Type: *Diphasium jussiaei* (Desv. ex Poir.) Rothm.; *Lycopodium jussiaei* Desv. ex Poir.

*Diphasiastrum* Holub: 104 (1975). Type: *Lycopodium complanatum* L.

Plants terrestrial. Stems protostelic, with parallel bands of xylem (plectostelic), anisotomously branched; main stems with indeterminate growth, creeping and rooting at irregular intervals, isophyllous, homophyllous; lateral branches with radially arranged xylem (actinostelic), erect or spreading branchlet systems arising in a dorso-lateral position on the main stem, with determinate growth, fertile branches heterophyllous. Leaves herbaceous to coriaceous, simple, aristate or not. Strobili erect, borne on simple or forked peduncles; sporophylls ephemeral, subpeltate or peltate, often with a basiscopic membranous wing on the stalk. Sporangia reniform, short-stalked, borne adaxially near the sporophyll base, epidermal cells with lignified, sinuate anticlinal walls, isovalvate. Spores spheroidal to subtriangular, trilete, reticulate, 30–45 µm in diameter. Gametophyte subterranean, obconic or convolute, holomycotrophic. Chromosome number based on  $2n = 46, 68$  and  $136$ .

A genus of perhaps 40 species with a near cosmopolitan distribution. Nine sections are recognized of which three are represented in southern Africa.

#### KEY TO THE SECTIONS:

- 1a Branchlet leaves aristate or with a membranous apex ..... 1. sect. **Lycopodium**
- 1b Branched leaves not aristate, herbaceous throughout:
  - 2a Sporophylls subpeltate, with a basiscopic membranous wing on the stalk ..... 2. sect. **Complanata**
  - 2b Sporophylls peltate, without a basiscopic membranous wing on the stalk ..... 3. sect. **Magellanica**

#### 1. Section **Lycopodium**

**Lycopodium clavatum** L., Species plantarum 2: 1101 (1753); Sim: 245 (1892); Sim: 328 (1915); Schelpe: 21 (1977); Schelpe & Diniz: 14 (1979); Jacobsen: 140 (1983); Schelpe & Anthony: 11 (1986); Burrows: 18 (1990). *Lepidotis clavata* (L.) P.Beauv.: 108 (1805). Type: Herb. Burser XX: 49 [UPS, lecto., designated by Jonsell & Jarvis (1994)].

*Lepidotis inflexa* P.Beauv.: 109 (1805). *Lycopodium inflexum* (P.Beauv.) Sw.: 179 (1806). *Lycopodium clavatum* L. var. *inflexum* (P.Beauv.) Spring: 90 (1842). Type: Ins. Borboniae, Bory de St. Vincent s.n. (G, holo.).

*Lycopodium clavatum* L. var. *natalense* Nessel: 191 (1934), as '*nataliense*'. Type: Natal, an trockenen Berghängen, *Holz s.n.* (?BONN, holo.).

**ILLUSTRATION:** De Vol: t. 5, fig. 1–6 (1980).

Terrestrial, in permanently moist forest margins, streambanks, montane thickets, and roadcuttings, exposed or lightly shaded, 500–2 300 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, São Tomé, Sudan, Kenya, Lesotho, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

2. Section **Complanata** Vict. in Contributions du Laboratoire del'Université de Montréal 3: 34, 89 (1925). Type: *Lycopodium complanatum* L.

**Lycopodium zanclophyllum** J.H.Wilce in Nova Hedwigia 3: 108, t. 3, fig. 9–10, t. 8 (1961). *Diphasium zanclophyllum* (J.H.Wilce) Rothm.: 235 (1962). *Lycopodium complanatum* L. subsp. *zanclophyllum* (J.H.Wilce) Schelpe: 128 (1969a); Jacobsen: 141 (1983); Schelpe & Anthony: 12 (1986); Burrows: 19 (1990). *Diphasiastrum zanclophyllum* (J.H.Wilce) Holub: 108 (1975). Type: Madagascar, Ost-Imerina, 1880, J.M. Hildebrandt 3781 (P, holo.; BM, BOL, BONN, P, US, iso.).

**ILLUSTRATION:** Fig. 2C & D; Schelpe & Anthony: t. 2, fig. 2, 2a (1986).

Terrestrial or epilithic, in permanently moist montane scrub, exposed or lightly shaded, 400–1 400 m.

**DISTRIBUTION:** South Africa. Also in the Madagascan region and Macaronesia.

3. Section **Magellanica** B.Øllg. in Opera Botanica 92: 172 (1987). Type: *Lycopodium magellanicum* (P.Beauv.) Sw.; *Lepidotis magellanica* P.Beauv.

**Lycopodium magellanicum** (P.Beauv.) Sw., Synopsis' filicum: 180 (1806). *Lepidotis magellanica* P.Beauv.: 102 (1805). Type: Fretum magellanicum, *sine coll. s.n.* (P-JU, holo.).

Terrestrial or epilithic, in permanently moist exposed conditions, 30–130 m.

**DISTRIBUTION:** Marion Island. Also in South America and the South Atlantic island groups.

**0112300 LYCOPODIELLA** Holub in Preslia 36: 20, 22 (1964). *Lycopodium* L. subgen. *Lycopodiella* (Holub) B.Øllg.: 49 (1979). Type: *Lycopodiella inundata* (L.) Holub; *Lycopodium inundatum* L.

*Palhinhaea* Vasc. & Franco: 24 (1967). Type: *Palhinhaea cernua* (L.) Vasc. & Franco; *Lycopodium cernuum* L.

*Pseudolycopodiella* Holub: 441 (1983). Type: *Pseudolycopodiella caroliniana* (L.) Holub; *Lycopodium carolinianum* L.

Plants terrestrial perennials. *Stems* protostelic (actinostelic), anisotomously branched; main stems creeping, with indeterminate growth, isophyllous or anisophyllous; rooting at irregular intervals; aerial shoot steles highly dissected (plectostelic), arise dorsally on the main stem, erect, simple or branched, of determinate growth, homophyllous or heterophyllous. *Leaves* herbaceous to coriaceous, simple. *Strobili* sessile and pendent, or stalked and erect; sporophylls simple, ephemeral, subpeltate. *Sporangia* reniform to subglobose, borne adaxially at the sporophyll base, epidermal cells with thin, straight, non-lignified walls, isovalvate or anisovalvate. *Spores* spheroidal, trilete, rugate or granulate, 30–45 µm in diameter. *Gametophyte* epigeal, tuberous and lobed, hemimycotrophic. Chromosome number based on  $2n = 78$  and 208.

A genus of perhaps 40 mostly pantropical species divided into four sections. Two sections are represented on the African subcontinent.

#### KEY TO THE SECTIONS:

Strobili stalked, erect; with simple, or forked, ending branchlets that arise dorsally on the creeping stem ..... 1. sect. **Caroliniana**  
Strobili sessile, pendent; with ending branchlet systems that are borne on an erect main branch ..... 2. sect. **Campylostachys**

1. Section **Caroliniana** (J.G.Bruce) B.Øllg. in Opera Botanica 92: 174 (1987). *Lycopodium* L. sect. *Caroliniana* J.G.Bruce: 136 (1976). Type: *Lycopodium carolinianum* L.

#### KEY TO THE SPECIES:

Dorsal leaves slightly shorter than the lateral leaves and not appressed ..... 1. **L. caroliniana**  
Dorsal leaves much reduced and appressed ..... 2. **L. sarcocaulon**

1. **Lycopodiella caroliniana** (L.) Pic.Serm. in Webbia 23: 165 (1968a). *Lycopodium carolinianum* L.: 1104 (1753); Sim: 246 (1892); Sim: 329 (1915); Schelpe: 21 (1970); Schelpe: 21 (1977); Schelpe & Diniz: 15 (1979); Jacobsen: 138 (1983); Schelpe & Anthony: 12 (1986); Burrows: 19 (1990). *Lepidotis caroliniana* (L.) P.Beauv.: 108 (1805). *Pseudolycopodiella caroliniana* (L.) Holub: 442 (1983). Type: Dillenius, J.J. Historia muscorum 452, t. 62, fig. 6 (1741), *Herb. Dillenius no. CXIII* (OXF, holo.).

*Lycopodium affine* Bory: 204, 262 (1804). *Lycopodium carolinianum* L. var. *affine* (Bory) Schelpe: 214 (1967); Schelpe: 21 (1970); Schelpe: 22 (1977); Schelpe & Diniz: 15 (1979); Jacobsen: 139 (1983). *Lycopodiella affinis* (Bory) Pic.Serm.: 165 (1968a). *Pseudolycopodiella affinis* (Bory) Holub: 79 (1985). Type: Rampant sur l'humus entre les vieilles scories humides a la plaine des osmundes dans l'enclos du Volcain de l'île Mascareigne, *Bory de St. Vincent s.n.* (P, holo.).

*Lycopodium ericetorum* Schrad.: 920 (1818). Type: South Africa, Cape Province, Löwenberg, *Hesse s.n.* (LE, holo.).

*Lycopodium tuberosum* Welw. & A. Braun ex Kuhn: 211 (1868). *Lycopodium carolinianum* L. var. *tuberosum* (Welw. & A. Braun ex Kuhn) Nessel: 274 (1939); Schelpe: 21 (1970); Schelpe: 23 (1977). *Pseudolycopodiella tuberosa* (Welw. & A. Braun ex Kuhn) Holub: 442 (1983). Type: Angola, districtus Huila, in declivibus spongiosis editoribus (alt. s. m. 5 000 ped.) de Morro de Lopollo, *Welwitsch* 167 (?B, holo.; BM, K, iso.).

**ILLUSTRATION:** Schelpe & Anthony: t. 2, fig. 3, 3a (1986).

Terrestrial, among grasses and sedges in permanently or seasonally marshy ground, exposed or lightly shaded, 500–2 200 m.

**DISTRIBUTION:** Angola, Burundi, Côté d'Ivoire, Democratic Republic of the Congo, Guinea, Liberia, Malawi, Mali, Mozambique, Nigeria, Sierra Leone, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region and north-eastern North America.

*Lycopodiella caroliniana* is a highly polymorphic taxon and several varieties are often recognized. The occurrence of intermediates, however, obscures the delimitation of distinct groups. Including var. *affinis* and var. *tuberosum* into *L. caroliniana* here follows a conservative approach.

2. **Lycopodiella sarcocaulon** (A. Braun & Welw. ex Kuhn) Pic. Serm. in Webbia 23: 166 (1968a). *Lycopodium sarcocaulon* A. Braun & Welw. ex Kuhn: 210 (1868). *Pseudolycopodiella sarcocaulon* (A. Braun & Welw. ex Kuhn) Holub: 442 (1983). Type: Angola, districtus Huila, in declivibus spongiosis editoribus de Morro de Lopollo, *Welwitsch* 168 [K, lecto., designated by Nessel (1939); P, isolecto.].

*Lycopodium carolinianum* L. var. *grandifolium* Spring: 46 (1850); Schelpe: 21 (1970); Schelpe: 22 (1977); Schelpe & Diniz: 16 (1979); Jacobsen: 139 (1983); Schelpe & Anthony: 13 (1986); Burrows: 20 (1990). Type: South Africa, Transvaal, Magaliesberg, *Burke* 531 [K!, lecto., designated by Schelpe & Anthony (1986)].

**ILLUSTRATION:** Schelpe & Anthony: t. 2, fig. 4, 4a (1986).

Terrestrial, among sedges and grasses in permanently or seasonally marshy ground, exposed or deeply shaded, 800–1 800 m.

**DISTRIBUTION:** Angola, South Africa, Malawi, Mozambique, South Africa, Zambia and Zimbabwe.

2. Section **Campylostachys** (Müll. Berol.) B. Øllg. in Opera Botanica 92: 175 (1987). *Lycopodium* L. sect. *Campylostachys* Müll. Berol.: 163 (1861). Type: *Lycopodium cernuum* L.

*Lycopodium* L. subgen. *Rhopalostachya* E. Pritz. sect. *Cernua* E. Pritz.: 602 (1901), p.p. Type: *Lycopodium cernuum* L.

**Lycopodiella cernua** (L.) Pic. Serm. in Webbia 23: 166 (1968a). *Lycopodium cernuum* L.: 1103 (1753); Sim: 244 (1892); Sim: 327 (1915); Schelpe: 20 (1970); Schelpe: 19 (1977); Schelpe & Diniz: 14 (1979); Jacobsen: 138 (1983); Schelpe & Anthony: 11 (1986); Burrows: 18 (1990). *Lepidotis cernua* (L.) P. Beauv.: 108 (1805). *Palhinhaea cernua* (L.) Vasc. & Franco: 25 (1967). Type: ?India, *sine coll. s.n.* (LINN 1257.13!, lecto., designated by Stearn 1979, notula in LINN).

*Lycopodium heeschii* Müll. Berol.: 164 (1861). Type: Sierra Leone, littoris Senegambiae, ad ripas fluminis in monte prope Freetown, 15/08/1844, *Heesch s.n.* (not located).

*Lycopodium secundum* Müll. Berol.: 164 (1861). Type: Cape Province and Natal, *Gueinzins s.n.* (syn.).

**ILLUSTRATION:** De Vol: t. 4, fig. 1–4 (1980).

Terrestrial, rarely epilithic, in marshy ground along perennial streams, forest margins, seepage areas and disturbed sites, exposed or partially shaded, 200–2 000 m.

**DISTRIBUTION:** Angola, Benin, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Liberia, Malawi, Mali, Mozambique, Nigeria, Pemba, Príncipe, Rwanda, São Tomé, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zanzibar and Zimbabwe. Also in the Madagascan region, pantropical.

Order SELAGINELLALES Prantl, Lehrbuch der Botanik für Mittelschulen: 116, 124 (1874), as 'Selaginelleae'.

4. **SELAGINELLACEAE** Willk., Prodrum florae hispanicae 1: 14 (1861). Type: *Selaginella* P. Beauv.

Plants terrestrial, epilithic, or epiphytic, ephemeral or perennial. *Stems* protostelic or siphonostelic; erect, creeping, or twining, simple, or dichotomously branched, isotomous or anisotomous, rarely soboliferous, glabrous or pubescent, isophyllous or anisophyllous, homophyllous or heterophyllous; roots (rhizophores) arising basally or throughout the length of the stem, mainly from the branch axils, dichotomously branched. *Leaves* simple, with an unbranched central vein, glabrous or pubescent, spirally or decussately arranged, ligulate; with anomocytic stomata. *Strobili* terminal on the primary or ultimate branches, isophyllous or anisophyllous, the apex occasionally reverting to become a vegetative shoot; sporophylls spirally arranged or in ranks of four. *Sporangia* short-stalked, thin-walled but with areas of thickened cells which aid dehiscence, borne adaxially just above the ligule; heterosporangiate, variously distributed throughout the strobilus. *Megaspores* trilete, usually 4 in each sporangium, with distinct equatorial muri, 200–600 µm in equatorial diameter; *microspores* trilete, >100 in each sporangium, 20–60 µm in diameter. *Gametophyte* endosporic; microgametophyte developing wholly within the microspore, wall rupturing to release the spermatozooids; megagametophyte minute, partially protruding from the megaspore wall. Chromosome number based on  $2n = 16, 18$  and  $20$ .

A monogeneric group of plants forming part of the lycopod stock. Fossil evidence shows that they have existed since the Devonian, a period of more than 400 million years, without much change.

**0113200 SELAGINELLA** P.Beauv., *Magazin encyclopédique*, Paris 9: 478 (1804b), nom. cons. Type: *Selaginella spinosa* P.Beauv., nom. illeg. (now *Selaginella selaginoides* (L.) Link; *Lycopodium selaginoides* L.).

Generic description as for the family.

A genus of approximately 700 species largely confined to the tropical areas of the world. Palisot de Beauvois (1805) first proposed the division of this large assemblage into smaller genera. The proposal never gained wide acceptance but more recently Thomas & Quansah (1991), supported by palaeobotanical evidence, also suggested that it be divided into at least two genera. They suggested a genus characterized by isophylly and another by anisophylly. Such a division, as subgenera of *Selaginella*, was first proposed by Spring (1850). The more conservative approach of Jermy (1986), who recognizes five subgenera, is followed here.

#### KEY TO THE SUBGENERA:

- 1a Stems erect, unbranched or compound, isophyllous; leaves decussately arranged or partly so ..... 1. subgen. **Ericetorum**
- 1b Stems creeping or prostrate, branched, secondary branches prostrate or erect, isophyllous or anisophyllous; leaves spirally or decussately arranged in four rows:
  - 2a Leaves spirally arranged, isophyllous or anisophyllous, usually coriaceous, the apex acute or setate ..... 2. subgen. **Tetragonostachys**
  - 2b Leaves arranged in four distinct rows, anisophyllous, herbaceous, the apex acute and never terminates in a seta:
    - 3a Strobili not complanate; sporophylls homophyllous or slightly heterophyllous ..... 3. subgen. **Stachygynandrum**
    - 3b Strobili complanate; sporophylls heterophyllous ..... 4. subgen. **Heterostachys**

1. Subgenus **Ericetorum** Jermy in *Fern Gazette* 13: 117 (1986). Type: *Selaginella uliginosa* (Labill.) Spring.

*Selaginella pygmaea* (Kaulf.) Alston in *Journal of Botany* 69: 257 (1931b); Jacobsen: 150 (1983); Schelpe & Anthony: 15 (1986); Burrows: 21 (1990). *Lycopodium pygmaeum* Kaulf.: 9 (1824). *Lycopodium pumilum* Schltld. var. *pygmaeum* (Kaulf.) Schltld.: 6 (1825a). *Lycopodioides pygmaeum* (Kaulf.) Kuntze: 825 (1891). Type: Habitat in Promontorio bonae spei ad radicem montis diaboli, *Bergius s.n.* (?B, holo.).

*Lycopodium bryoides* Kaulf.: 10 (1824). *Lycopodium pumilum* Schltld. var. *bryoides* (Kaulf.) Schltld.: 6 (1825a). *Selaginella bryoides* (Kaulf.) Hieron.: 499 (1900c), non Underw. (1900). Type: Habitat in Promontorio bonae spei, *Bergius s.n.* (?B, holo.).

*Lycopodium pumilum* Schltld.: 6 (1825a). *Selaginella pumila* (Schltld.) Spring: 60 (1850); Sim: 249 (1892); Sim: 332 (1915). Type: In Promontorio bonae spei ad radicem montis diaboli in latere occidentali in solo argillaceo, Nov., *Bergius s.n.* (not located); ad lacum Neisna, Oct., *Mund et Maire s.n.* (not located).

*Selaginella pumila* (Schltld.) Spring var. *ramosa* Spring: 61 (1850), nom. abort. Type: Based on *Lycopodium pumilum* Schltld. var. *bryoides* (Kaulf.) Schltld.

*Selaginella pumila* (Schltld.) Spring var. *subsimplex* Spring: 61 (1850), nom. abort. Type: Based on *Lycopodium pygmaeum* Schltld.

**ILLUSTRATION:** Schelpe & Anthony: t. 5, fig. 1, 1a (1986).

Terrestrial, ephemeral herbs confined to the winter rainfall region of the Western Cape, growing in seasonally damp shaded conditions, 100–500 m.

**DISTRIBUTION:** South Africa. Also in northern Australia.

2. Subgenus **Tetragonostachys** (A.Braun) Jermy in *Fern Gazette* 13: 118 (1986). *Selaginella* P.Beauv. ser. *Tetragonostachyae* A.Braun: 11 (1857). *Selaginella* P.Beauv. subgen. *Selaginella* sect. *Tetragonostachys* (A.Braun) Hieron.: 669 (1901a). Type: *Selaginella rupestris* (L.) Spring.

#### KEY TO THE SPECIES:

- 1a Sporophylls in 2 ranks ..... 2. **S. dregei**
- 1b Sporophylls in 4 ranks:
  - 2a Leafy stems dorsoventrally flattened ..... 4. **S. njam-njamensis**
  - 2b Leafy stems radially symmetrical:
    - 3a Leaf seta  $\frac{1}{4}$  as long as the blade ..... 3. **S. nivea**
    - 3b Leaf seta less than  $\frac{1}{4}$  the length of the blade ..... 1. **S. caffrorum**

1. *Selaginella caffrorum* (Milde) Hieron. in *Hedwigia* 39: 313 (1900a); Schelpe: 24 (1977); Jacobsen: 144 (1983); Schelpe & Anthony: 19 (1986); Burrows: 25 (1990). *Selaginella rupestris* (L.) Spring forma *caffrorum* Milde: 262 (1867). *Bryodesma caffrorum* (Milde) Soják: 154 (1993). Type: Kafferland, *Bunge s.n.* (P, holo.).

*Selaginella rupestris* (L.) Spring var. *incurva* A.Braun ex Kuhn: 213 (1868), p.p. Type: *Lycopodium rupestre* a, Drège s.n. [B, lecto., designated by Tryon (1955)].

*Selaginella rupestris* (L.) Spring var. *incurva* A.Braun ex Kuhn forma *angolensis* A.Braun: 213 (1868). Type: Angola, distr. Huíla, in rupestribus dumetosis ad 5 000 ped. alt. montium de Lopollo, *Welwitsch* 169 (B, holo.; BM, P, iso.).

*Selaginella rupestris* (L.) Spring var. *incurva* A.Braun ex Kuhn forma *capensis* A.Braun: 213 (1868), nom. inval. Type: Prom. bon. spei, *Ecklon & Zeyher* 7; in monte Katberg, in campis graminosis 4–5 000 ped. alt., Drège s.n. (*Lycopodium rupestre*  $\alpha$ ); Witbergen, locis petrosis 5–6 000 ped. alt., Drège s.n. (*Lycopodium rupestre*  $\alpha\alpha$ ).

*Selaginella capensis* Hieron.: 314 (1900a). Type: *Lycopodium rupestre*  $\alpha$ , Drège s.n. [B, lecto., designated by Tryon (1955)].

*Selaginella rupestris* sensu Sim, 332, t. 179, fig. 2 (1915).

var. **caffrorum**.

**ILLUSTRATIONS:** Fig. 2F–I; Alston: t. 620, fig. A–D (1939a).

Terrestrial or epilithic, a poikilohydrous xerophyte forming dense mats in exposed rock crevices or in seasonally moist soil pockets in montane environments, in full sun or light shade, 800–1 900 m.

**DISTRIBUTION:** Angola, Burundi, Kenya, Lesotho, South Africa, Tanzania and Uganda.

var. **aethiopica** Bizzarri occurs in Ethiopia and Eritrea.

2. *Selaginella dregei* (C.Presl) Hieron. in Hedwigia 39: 315, t. 36 (1900a); Jermy: 23 (1970); Schelpe & Jermy: 25 (1977); Jermy & Diniz: 18 (1979); Jacobsen: 143 (1983); Schelpe & Anthony: 17 (1986); Burrows: 22 (1990). *Lycopodium dregei* C.Presl: 583 (1945a); 153 (1846). *Selaginella rupestris* (L.) Spring forma *dregei* (C.Presl) Milde: 262 (1867). *Selaginella rupestris* (L.) Spring var. *recurva* forma *dregei* (C.Presl) A.Braun ex Kuhn: 214 (1868), as '*dregeana*'. *Bryodesma dregei* (C.Presl) Soják: 154 (1993). Type: Umsikaba River, Drège s.n. (PR, holo.; BM, iso.).

*Selaginella dregei* (C.Presl) Hieron. var. *buchmanniana* Hieron.: 317 (1900a). Type: Südost-Afrika, Pondoland, *Buchanan* 9 (B!, holo.).

*Selaginella dregei* (C.Presl) Hieron. var. *pretoriensis* Hieron.: 317 (1900a). Type: Transvaal, near Pretoria, colles supra Aapiessrivier, *Rehmann* 4333 [B!, lecto., designated by Tryon (1955)].

*Selaginella dregei* (C.Presl) Hieron. var. *rehmanniana* Hieron.: 317 (1900a). Type: Transvaal, Houtbosch, *Rehmann* 5576 [B!, lecto., designated by Tryon (1955); BOL, K, isolecto.].

*Selaginella grisea* Alston: 222 (1939a), nom. nov. for *Selaginella dregei* (C.Presl) Hieron. var. *hildebrandtiana* Hieron.: 317 (1900a); Burrows: 24 (1990). Type: Kenya, Egu, zwischen Duruma u' Taita, 01/1877, *Hildebrandt* 2363 [B, lecto., designated by Tryon (1955); BM, isolecto.].

**ILLUSTRATION:** Alston: t. 620, fig. E–H (1939a).

Terrestrial or epilithic, a poikilohydrous xerophyte forming dense mats in exposed rock crevices or in seasonally moist soil pockets in montane environments, mostly in full sun, 500–1 500 m.

**DISTRIBUTION:** Angola, Botswana, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

3. *Selaginella nivea* Alston ex Alston [H. Perrier de la Bâthie, Catalogue des plantes de Madagascar: 71 (1932), nom. nud.] in Dansk Botanisk Arkiv 7: 194 (1932b); Jermy: 25 (1970); Jermy & Diniz: 20 (1979); Jacobsen: 144 (1983); Burrows: 25 (1990). Type: Madagascar, Environs d'Ampanihy, Sud-Quest, *H. Perrier de la Bâthie* 8303 (BM, holo.).

subsp. **nivea**

**DISTRIBUTION:** Botswana, Mozambique and Zimbabwe. Also in the Madagascan region.

subsp. **humbertii** S.Stefanovic & Rakotondrainibe is restricted to Mt Itremo and Mt Iby in Central Madagascar.

4. *Selaginella njam-njamensis* Hieron. in Hedwigia 39: 312, fig. 28 (1900a); Jermy: 23 (1970); Schelpe & Jermy: 25 (1977); Jermy & Diniz: 19 (1979); Schelpe & Anthony: 19 (1986). *Bryodesma njamnjamense* (Hieron.) Soják: 154 (1993). Type: Sudan, Njam-Njam, *Schweinfurth* s.n. (B, holo.; NY, K, P, iso.).

Terrestrial or epilithic, a poikilohydrous xerophyte in exposed rock crevices or seasonally moist soil pockets in montane environments, mostly in full sun, 800–1 060 m.

**DISTRIBUTION:** Angola, Benin, Botswana, Malawi, Mali, Mozambique, Nigeria, Sudan, Tanzania, Uganda and Zambia.

3. Subgenus **Stachygynandrum** (P.Beauv.) Baker in Journal of Botany 21: 3 (1883a), emend. Jermy: 118 (1986). *Stachygynandrum* P.Beauv. ex Mirb.: 477 (1802), p.p. Type: *Selaginella flabellata* (L.) Spring; *Lycopodium flabellatum* L.

#### KEY TO THE SPECIES:

- 1a Stems twining:
  - 2a Lateral leaves ciliate ..... 13. *S. volubilis*
  - 2b Lateral leaves denticulate ..... 8. *S. myosurus*
- 1b Stems erect or prostrate, never twining:
  - 3a Stems pubescent ..... 12. *S. vogelii*
  - 3b Stems glabrous:
    - 4a Sporophylls heterophyllous:
      - 5a Stems soboliferous ..... 1. *S. abyssinica*
    - 5b Stems not soboliferous:
      - 6a Primary branch systems prostrate ..... 9. *S. perpusilla*
      - 6b Primary branch system semi-prostrate or erect:
        - 7a Median leaves mucronate ..... 10. *S. subisophylla*

- 7b Median leaves aristate ..... 7. *S. molliceps*
- 4b Sporophylls homophyllous:
  - 8a Stems erect or arching ..... 11. *S. versicolor*
  - 8b Stems prostrate:
    - 9a Lateral leaves ciliate; stems angular ..... 2. *S. cathedrifolia*
    - 9b Lateral leaves denticulate; stems terete:
      - 10a Leaves discolorous ..... 4. *S. imbricata*
      - 10b Leaves concolorous:
        - 11a Primary branch system erect ..... 3. *S. eublepharis*
        - 11b Primary branch system prostrate:
          - 12a Lateral leaves up to 2 mm long ..... 6. *S. mittenii*
          - 12b Lateral leaves up to 4 mm long ..... 5. *S. kraussiana*

1. *Selaginella abyssinica* Spring in Mémoires de l'Académie Royale des Sciences, Belgique 24: 99 (1850). *Selaginella goudotiana* Spring var. *abyssinica* (Spring) Bizzarri: 585 (1975); Jermy: 27 (1970); Schelpe & Jermy: 29 (1977); Jermy & Diniz: 24 (1979); Jacobsen: 148 (1983); Burrows: 29 (1990). Type: Voyage de M. Quartin-Dillon en Abyssinie, Sholoda, *Quartin-Dillon* 9 [P, lecto., designated by Bizzarri (1975); P, isolecto.].

*Selaginella kirkii* Baker: 176 (1885). Type: Usagura Mts. E. Trop. Africa, 08/1884, *J. Kirk* s.n. (K, holo., A only).

*Selaginella goetzei* Hieron.: 265 (1901b). Type: Ukinga-Berge. Kingika-Berg. Schattigen Erdriss um 2 600 m, Goetze 941 (B 121594, holo.; K, P, iso.).

*Selaginella preussii* Hieron.: 686 (1901a). Type: In Kamerun, *Preuss* 978 [B 121592, lecto., designated by Bizzarri (1975)].

*Selaginella whytei* Hieron.: 697 (1901a). Type: Im nördlichen Nyasaland, *Whyte* s.n. ex herbario Sir Harry H. Johnston (B 121595, holo.; K, iso.).

*Selaginella buensis* Hieron.: 20 (1904). Type: Kamerun, *Preuss* 1079 (B 121590, holo.; K, iso.).

ILLUSTRATION: Jermy: t. 5, fig. 1–8 (1970).

Terrestrial or epilithic, confined to seasonally moist sites in evergreen and deciduous forests, and along stream and riverbanks, frequent near waterfalls, light or deeply shaded, dormant during the dry season, 800–2 100 m.

DISTRIBUTION: Angola, Bioko, Burundi, Cameroon, Congo, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, Ghana, Kenya, Nigeria, Malawi, Mozambique, Nigeria, Rwanda, Somalia, Tanzania, Uganda, Zambia and Zimbabwe.

2. *Selaginella cathedrifolia* Spring in Mémoires de l'Académie Royale des Sciences, Belgique 24: 112 (1850); Schelpe & Jermy: 29 (1977). Type: Principe, *Curror* 3 (K, holo.).

*Selaginella cathedrifolia* Spring var. *minor* A.Braun ex Kuhn: 211 (1868). Type: Angola, prope Pungo Andongo, in cryptis et ad latera umbrosa rivulorum, *Welwitsch* 44 (not located); ad rupes gneissicas apricas in summis montibus, *Welwitsch* 43 (not located).

Terrestrial, moist areas in forests and roadcuttings in forests, 300–800 m.

DISTRIBUTION: Angola, Bioko, Cameroon, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Nigeria, Principe, Sierra Leone and Togo.

3. *Selaginella eublepharis* A.Braun, *Natürlichen Pflanzenfamilien* 1(4): 677 (1901); Jermy: 27 (1970); Jermy & Diniz: 23 (1979); Jacobsen: 147 (1983). Type: In Deutsch Ostafrika (Zanzibar-küste, Usaramo), *Hildebrandt* 1961 (B 86969, lecto.; B 86967, B 86968, syn.).

On rocks in seasonally moist savannah or grasslands, exposed or partially shaded, 300–800 m.

DISTRIBUTION: Malawi, Mozambique and Tanzania.

4. *Selaginella imbricata* (Forssk.) Spring ex Decne. in Archives du Muséum d'Histoire Naturelle 2: 193, t. 7 (1841); Sim: 336 (1915); Jermy: 25 (1970); Jermy & Diniz: 20 (1979); Jacobsen: 144 (1983); Schelpe & Anthony: 19 (1986); Burrows: 26 (1990). *Lycopodium imbricatum* Forssk., CXXV, 187 (1775). Type: Yemen, Hadie, ad Uahfât, 29/03/1763, *Forsskål* s.n. (C!, holo., p.p.; LD, iso.).

ILLUSTRATION: Schelpe & Anthony: t. 5, fig. 2, 2a–c (1986).

Epilithic, a poikilohydrous herb in seasonally moist sites, mostly cliff faces, exposed or partially shaded, 330–3 000 m.

DISTRIBUTION: Kenya, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. Also in the Madagascan region and Arabia.

5. *Selaginella kraussiana* (Kunze) A.Braun, *Index seminum in Horto botanico berolensi anno 1859 collectorum*: 22 (1860); Sim: 252 (1892); Sim: 335 (1915); Jermy: 26 (1970); Schelpe & Jermy: 30 (1977); Jermy & Diniz: 22 (1979); Jacobsen: 146 (1983); Schelpe & Anthony: 20 (1986); Burrows: 28 (1990). *Lycopodium kraussianum* Kunze: 114 (1844b). Type: Ad portum Natalensem inter Omfondi et Tagela in sylvis umbris humidis, et in coronis rupium saxis adpressum, nec non in faucibus umbris sylvarum prope rivulum haud procul a Chakas-Kraal, *Gueinzus* s.n. [K, lecto., designated by Bizzarri (1975); Fl, P, W, isosyn.].

*Selaginella hortensis* Mett.: 125, 128 (1856). Type: Cultra in Horto Botanico Lipsiensi (LZt; K, lecto., designated by Bizzarri (1975); B 120828, isolecto.).



**ILLUSTRATION:** Schelpe & Anthony: t. 6, fig. 1, 1a (1986).

Terrestrial or epilithic, a hygrophyllous herb in moist forests, along shaded streambanks and roadcuttings, 30–2 500 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Congo, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Uganda and Zimbabwe. Also in Macaronesia.

6. *Selaginella mittenii* Baker in Journal of Botany 21: 81 (1883a); Jermy: 26 (1970); Schelpe & Jermy: 29 (1977); Jermy & Diniz: 21 (1979); Jacobsen: 145 (1983); Schelpe & Anthony: 20 (1986); Burrows: 28 (1990). Type: Tanzania, Usagura Mountains, 01/1883, *Mitten s.n.* (K!, holo.).

*Selaginella welwitschii* Baker: 81, 82 (1883a). Type: Angola, on dry rocks of the Pedras of Pungo Andongo, *Welwitsch 43* (K!, holo.).

*Selaginella mackenii* Baker: 89 (1884). Type: Natal, Tugela River, *Gerrard & McKen 237* (K!, holo.).

*Selaginella cooperii* Baker: 89 (1884). Type: Orange Free State, *Cooper 1056* (K!, holo.).

*Selaginella tectissima* Baker: 89 (1884). Type: Transvaal, Magaliesberg, *Sanderson s.n.* (K!, holo.).

*Selaginella depressa* sensu Sim, 334, t. 168c (1915), non Spring (1843b).

**ILLUSTRATIONS:** Fig. 2E; Schelpe & Anthony: t. 5, fig. 3, 3a (1986).

Terrestrial or epilithic, permanently or seasonally moist sites in forests, along streambanks and in rocky places in montane regions, exposed or deeply shaded, 500–1 800 m.

**DISTRIBUTION:** Angola, Burundi, Kenya, Lesotho, Malawi, Mozambique, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

7. *Selaginella molliceps* Spring in Mémoires de l'Académie Royale des Sciences, Belgique 24: 257 (1850); Sim: 339 (1915); Schelpe & Jermy: 31 (1977). Type: Prov. Príncipe, *Curror s.n.* (K, holo.).

*Selaginella rubricaulis* R.Sim var. *angolensis* A.Braun ex Kuhn: 212 (1868). *Stachygynandrum rubricaulis* (R.Sim) Carruth. var. *angolense* (A.Braun ex Kuhn) Carruth.: 262 (1901) Type: Angola, Golungo, juxta rivulum de Capopa, *Welwitsch 47* (K, syn.); Insula Principis, in sinu Biafra, montis Pico de Papagaio, *Welwitsch 11* (K, syn.).

**ILLUSTRATION:** Tardieu-Blot: t. 3, fig. 6–8 (1964b).

Terrestrial or epilithic, in damp, deeply shaded places in forests.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Nigeria, Príncipe, São Tomé, Togo, Uganda and Zimbabwe.

8. *Selaginella myosurus* (Sw.) Alston in Journal of Botany 70: 64 (1932a); Schelpe & Jermy: 26 (1977). *Lycopodium myosurus* Sw.: 118 (1801). Type: Sierra Leone, *Afzelius s.n.* (B, iso.).

*Stachygynandrum scandens* P.Beauv.: 483 (1804a). *Selaginella scandens* (P.Beauv.) Spring: 226 (1843b). Type: In regno Oware, ad ripas fluminis Formose, *Palisot de Beauvois s.n.* (P-JU 705, holo.).

**ILLUSTRATION:** Alston: t. 1, fig. a–c (1959).

Terrestrial, in moist forest margins, roadcuttings and disturbed sites in forests.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Kenya, Liberia, Mali, Nigeria, Príncipe, Senegal, Sierra Leone, Tanzania and Togo.

9. *Selaginella perpusilla* Baker in Journal of Botany 23: 292 (1885); Jermy: 29 (1970); Jacobsen: 149 (1983); Burrows: 22 (1990). Type: Nyika Country, E. Trop. Africa, *Rev. T. Wakefield, comm. Col. Grant s.n.* (K, holo., BM, iso.).

**DISTRIBUTION:** Kenya, Malawi, Tanzania, Zanzibar and Zimbabwe. Also in Madagascar.

10. *Selaginella subisophylla* Jermy in British Fern Gazette 10: 30, fig. 1–9 (1968); Jermy: 25 (1970). Type: Zambia, Kawambwa Distr., Kawambwa, Timnatushi Falls, in wet white sand, 1 260 m alt., 19/04/1957, *Richards 9325* (BM, holo.; K, iso.).

**ILLUSTRATION:** Jermy: fig. 1–9 (1968).

Terrestrial, in moist conditions along streams, shaded, 1 260 m.

**DISTRIBUTION:** Democratic Republic of the Congo and Zambia.

11. *Selaginella versicolor* Spring in Bulletins de l'Académie Royale des Sciences, Bruxelles 10: 143 (1843a); Schelpe & Jermy: 28 (1977). *Stachygynandrum versicolor* (Spring) Carruth.: 262 (1901). Type: In Senegambia, in abruptis ad tribum Landiumas dictam, *Heudelot s.n.* (P, holo.).

*Selaginella nitens* Baker: 48 (1885). Type: Fernando Po, *G. Mann s.n.* (missing); Cameroon Mountains, *Kalbreyer s.n.* (missing).

Epilithic or epiphytic, in damp, deeply shaded forests.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Liberia, Nigeria, Sierra Leone, Sudan, Tanzania, Togo and Uganda.

12. ***Selaginella vogelii*** Spring in Mémoires de l'Académie Royale des Sciences, Belgique 24: 170 (1850); Schelpe: 28 (1977). Type: *Loco incerto*, Vogel s.n. (K, holo.).

*Selaginella dinklageana* Sadeb.: 16 (1897). Type: Cameroons, Ebeafölle des hokundje, *Dinklage* 241 (HBG, holo.).

*Selaginella pervillei* sensu Alston: 11 (1934).

Terrestrial, in damp deeply shaded places in forests.

**DISTRIBUTION:** Angola, Benin, Bioko, Cameroon, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Kenya, Liberia, Mali, Mozambique, Nigeria, Sierra Leone, Tanzania and Zanzibar. Also in Madagascar.

13. ***Selaginella volubilis*** Alston in Boletim da Sociedade Broteriana, Sér. 2, 30: 25 (1956a); Schelpe: 26 (1977). Type: Angola, Saurimo, Young 637 (BM, holo.).

**ILLUSTRATION:** Schelpe & Jermy: t. 3, fig. 1–5 (1977).

Terrestrial, twining in scrub and trees along damp forest margins.

**DISTRIBUTION:** Angola and Bioko.

4. Subgenus ***Heterostachys*** Baker in Journal of Botany 21: 4 (1883a). Lectotype: *Selaginella heterostachys* Baker.

***Selaginella tenerrima*** A.Braun ex Kuhn, Filices africanae: 193 (1868); Jermy & Schelpe: 29 (1970); Jermy: 30 (1977); Jermy & Diniz: 25 (1979); Jacobsen: 149 (1983). *Stachygynandrum tenerrimum* (A.Braun ex Kuhn) Carruth.: 262 (1901). Type: Angola, distr. Golungo Alto, ad rivulos in silvis primitivis editior de Serra de Alta Queta, Welwitsch 45 (K, holo.).

Terrestrial or epilithic, in seasonally moist sites along watercourses, shaded, 750–1 800 m.

**DISTRIBUTION:** Angola, Burundi, Cameroon, Central African Republic, Guinea, Mali, Mozambique, Nigeria and Zambia.

Order ISOETALES Prantl, Lehrbuch der Botanik für Mittelschulen: 116, 125 (1874), as 'Isoeteae'.

5. **ISOETACEAE** Dumort., Analyse des familles des plantes: 67 (1829) as 'Isoetineae'. Type: *Isoetes* L.

Plants terrestrial or aquatic perennials; evergreen, or deciduous when in seasonally wet habitats. *Stems* protostelic, erect, short, bilobed or trilobed; roots dichotomously branched, arising from a basipetal growing point beneath the rhizome. *Leaves* spirally arranged, terete or flat, proximally winged, with a single unbranched vascular strand; stomata of the anomocytic type when present, arranged in longitudinal rows, ligulate. *Sporangia* sessile, ovoid or globose, thin-walled, initially embedded in the adaxial surface of the leaf base below the ligule, partially or entirely covered by a thin velum. Spores heterosporous, without chlorophyll; *megaspores* trilete, with a pronounced laesura and an equatorial ridge, 250–800 µm in diameter; *microspores* monolete, 20–40 µm in diameter. *Gametophyte* endosporic, minute, partially protruding from the megaspore or microspore wall. Chromosome number based on  $2n = 22$ .

The Isoetaceae is a monogeneric family that forms part of the lycopod stock. Fossil evidence supports its existence since the Carboniferous (Collinson 1996).

**0114100 ISOETES** L., Species plantarum 2: 1100 (1753). Lectotype: *Isoetes lacustris* L., designated by Jonsell & Jarvis (1993).

Generic description as for the family. A genus of perhaps 150 species widely distributed throughout the world. *Stylites* Amstutz is sometimes recognized as a separate genus.

#### KEY TO THE SUBGENERA:

- 1a Stem massive, erect, often dichotomously branched, elongate, with unbranched roots arising from a single groove running the length of the stem; leaves flat, rigid, estomate; sporangia more or less superficial, often several centimetres above the base of the sporophyll ..... subgen. **Stylites**
- 1b Stem corm-like, rarely branched, usually with dichotomously branched roots arising in a basipetal notch; leaves terete, often flaccid and slender, with or without stomata; sporangia at least partially immersed in the base of the sporophyll:
  - 2a Leaves partially laminate, with reduced alae and a distal subula ..... subgen. **Isoetes**
  - 2b Leaves completely laminate, alate and without a distal subula ..... subgen. **Euphyllum**

Only subgenus *Isoetes* is represented on the African continent. Subgenus *Euphyllum* Hickey characterized by alate leaves is confined to North America (Hickey 1990).

Subgenus ***Isoetes***

Section ***Isoetes***

Section *Isoetes* is characterized by the presence of sclerified paleae and sclerified persistent leafbases. Section *Coromandelina* Hickey & W.C.Taylor, confined to the Indian subcontinent, is characterized by the absence of sclerified paleae and phyllopodia (Taylor & Hickey 1992).

# KEY TO THE SPECIES:

- 1a Megaspores almost smooth ..... 6. ***I. transvaalensis***
- 1b Megaspores distinctly ornamented:
  - 2a Megaspores reticulate or foveolate:
    - 3a Perennially submerged aquatic plants; leaves flat, more than 220 mm long ..... 8. ***I. wormaldii***
    - 3b Seasonally submerged aquatic plants; leaves terete, less than 220 mm long ..... 5. ***I. stellenbossiensis***
  - 2b Megaspores tuberculate or verrucate:
    - 4a Velum absent:
      - 5a Distal face of megaspores with spaced papillae arising from a even-textured spore wall; sporophylls more than 250 mm long..... 4. ***I. schweinfurthii***
      - 5b Distal face of megaspores verrucate or often with crowded papillae of equal size arising from a rugulose or uneven spore wall; sporophylls usually less than 200 mm long ..... 7. ***I. welwitschii***
    - 4b Velum present:
      - 6a Velum incomplete ..... 1. ***I. aequinoctialis***
      - 6b Velum complete:
        - 7a Rhizome 2-lobed ..... 6. ***I. stephanseniae***
        - 7b Rhizome 3-lobed:
          - 8a Distal face of megaspore with verrucae and anastomosing tubercles ..... 2. ***I. capensis***
          - 8b Distal face of megaspore with discrete tubercles, often crowded but not coalescing ..... 3. ***I. giessii***

1. ***Isoetes aequinoctialis*** Welw. ex A.Braun, *Filices africanae*: 195 (1868); Jermy: 30 (1970); Schelpe & Jermy: 31 (1977); Jacobsen: 155 (1983); Schelpe & Anthony: 25 (1986); Burrows: 33 (1990). *Calamaria aequinoctialis* (Welw. ex A.Braun) Kuntze: 828 (1891). Type: Angola. In pascuis arenosis humidiusculis silvaticis inter Pungo Andogo et Sansamanda non procul a ripa fluminis Cuanza, 1857, *Welwitsch* 50 (B, holo.; BM, K!, LISU, iso.).

*Isoetes erongoensis* Wanntorp: 150 (1970). Type: South West Africa, Karibib District, 'Ameib', c. 25 km north-west of Usakos, *Wanntorp* 992 (S, holo.).

ILLUSTRATION: Schelpe & Anthony: t. 8, fig. 4, 4a (1986).

Terrestrial, in perennial streams and seasonally waterlogged sites, 1 225–1 350 m.

DISTRIBUTION: Angola, Namibia, Tanzania, Zambia and Zimbabwe.

2. ***Isoetes capensis*** A.V.Duthie in *Transactions of the Royal Society of South Africa* 17: 330, t. 11, fig. 3, t. 12, fig. 1, 2 (1929); Jacobsen: 156 (1983); Schelpe & Anthony: 23 (1986); Burrows: 30 (1990). Type: Cape Peninsula, temporary vleis, *Duthie s.n. in Stellenbosch distr. Herb. 2001* [NBG!, lecto., designated by Schelpe & Anthony (1986); BM, K!, NBG!, PRE, PRU, isolecto.].

ILLUSTRATION: Schelpe & Anthony: t. 7, fig. 2, t. 8, fig. 1, 1a (1986).

Terrestrial, among sedges and grasses in seasonally moist or flooded areas, 50–150 m.

DISTRIBUTION: South Africa.

3. ***Isoetes giessii*** Launert in *Mitteilungen der Botanischen Staatssammlung München* 2: 309 (1957); Launert: 1.1 (1969); Burrows: 32 (1990). Type: Südwestafrika, Distr. Gideon Haribes, zerstreut in seichten Wasser, 11/04/1956, *O.H. Volk* 12323 (M, holo.; BM, BOLI, iso.).

*Isoetes perrieriana* sensu Jacobsen: 156 (1983); Schelpe & N.C.Anthony: 25 (1986).

ILLUSTRATION: Schelpe & Anthony: t. 8, fig. 2, 2a (1986).

Terrestrial, along the edges of seasonally flooded pans and rockpools.

DISTRIBUTION: Namibia.

4. ***Isoetes schweinfurthii*** A.Braun ex Baker in *Journal of Botany* 18: 108 (1880); Jacobsen: 153 (1983); Schelpe & Anthony: 28 (1986); Burrows: 36 (1990). *Calamaria schweinfurthii* (A.Braun ex Baker) Kuntze: 828 (1891). Type: Central Africa, in the Kingdom of Djur, *Schweinfurth* 1962 [B, lecto., designated by Schelpe & Anthony (1986); BM, FI, K, P, isolecto.].

*Isoetes rhodesiana* Alston: 17 (1956a); Jermy: 30 (1970); Jacobsen: 153 (1983). Type: Rhodesia, submerged in water storage tank with artificially puddled bottom, pasture sub-station, Bongola, *West* 30263 (BM, holo.; K, SRGH, iso.).

*Isoetes alstonii* C.F.Reed & Verdc.: 19 (1965); Jermy: 30 (1970); Jermy & Diniz: 26 (1979); Jacobsen: 154 (1983); Launert: 1.1 (1969); Burrows: 36 (1990). Type: Southern Rhodesia, Victoria falls, south bank in front of and under the spray of the main falls, in boggy places, 29/08/1947, *Greenway & Brenan* 8012 (EA, holo.; BM, K!, PRB, PRE, SRGH!, iso.).

*Isoetes kersii* Wanntorp: 146 (1970). Type: South West Africa, Ondangwa-Ruacana Falls, c. 8 km. west of Eunda, *Kers* 1389 (S, holo.).

ILLUSTRATION: Jermy: t. 6, fig. 1–6 (1970).

Terrestrial, aquatic or in moist soil near waterfalls and along pool edges, 880–1 100 m.

**DISTRIBUTION:** Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe. Also in Madagascar.

5. ***Isoetes stellenbossiensis*** A.V.Duthie in Transactions of the Royal Society of South Africa 17: 328, 329, t. 2, 3, 7; t. 11, fig. 1, 2 (1929); Jacobsen: 156 (1983); Schelpe & Anthony: 27 (1986); Burrows: 32 (1990). Type: Stellenbosch Flats, *Duthie s.n. in Stellenbosch Distr. Herb. 2004* [NBG!, lecto., designated by Schelpe & Anthony (1986); BM, BOL!, K!, NBG!, PRE, PRU, isolecto.].

**ILLUSTRATION:** Schelpe & Anthony: fig. 8, t. 6, 6a (1986).

Terrestrial, among sedges and grasses in seasonally moist or flooded areas, 50–200 m.

**DISTRIBUTION:** South Africa.

6. ***Isoetes stephanseniae*** A.V.Duthie in Transactions of the Royal Society of South Africa 17: 330 (1929). Type: Seasonally swamp, Stellenbosch flats, *Duthie s.n. in Stellenbosch distr. Herb. 2005* [NBG!, lecto., designated by Schelpe & Anthony (1986); BM, BOL!, K!, NBG!, PRE, PRU, isolecto.]. *Isoetes capensis* A.V.Duthie var. *stephanseniae* (A.V.Duthie) Schelpe & N.C. Anthony: 555 (1985a); Schelpe & Anthony: 25 (1986); Burrows: 32 (1990), as '*stephansenii*'.

**ILLUSTRATION:** Schelpe & Anthony: fig. 8, t. 6, 6a (1986).

Terrestrial, in seasonally flooded areas and rockpools on granite, 50–150 m.

**DISTRIBUTION:** South Africa.

7. ***Isoetes transvaalensis*** Jermy & Schelpe in Contributions from the Bolus Herbarium 10: 150 (1982); Schelpe & Anthony: 25 (1986); Burrows: 33 (1990). Type: Transvaal, Blaauwberg, shallow pools in kloof near summit, 26/04/1961, *H.P. van der Schijff 5463* (BM, holo.; BOL!, PRU, iso.).

**ILLUSTRATION:** Schelpe & Anthony: fig. 8, t. 3, 3a (1986).

Terrestrial, in seasonally flooded rockpools, 1 500–1 900 m.

**DISTRIBUTION:** Lesotho and South Africa.

8. ***Isoetes welwitschii*** A.Braun ex Kuhn, Filices africanae: 196, 197 (1868); Schelpe: 32 (1977); Jacobsen: 154 (1983); Schelpe & Anthony: 28 (1986); Burrows: 34 (1990). *Calamaria welwitschii* (A.Braun ex Kuhn) Kuntze: 282 (1891). Type: In Angolae districto Huila, in pascuis breve herbidis editissimis arenoso-humosis de Empalanca in Morro de Lopollo in 5 000 ped. circa 1860, *Welwitsch 166* (B, holo.; BM, K, LISU, iso.).

*Isoetes natalensis* Baker: 132 (1887a); Sim: 340 (1915). *Calamaria natalensis* (Baker) Kuntze: 828 (1891). Type: Natal, Estcourt, Griffins Hill, A. Rehmann 7296 (K!, holo.; BM, P, iso.).

**ILLUSTRATION:** Schelpe & Anthony: fig. 8, t. 7, 7a (1986).

Terrestrial, in seasonally moist areas with sedges, 1 200–1 700 m.

**DISTRIBUTION:** Angola, Kenya and South Africa. Also in Madagascar.

9. ***Isoetes wormaldii*** Sim in Transactions of the South African Philosophical Society 16: 299, 300, t. 5 (1906); Sim: 340 (1915); Jacobsen: 152 (1983); Schelpe & Anthony: 27 (1986); Burrows: 37 (1990). Type: In ponds around East London, and in the Victoria Park, East London, 11/1893, *Sim 1567* [NBG!, lecto., designated by Schelpe & Anthony (1986); BM, BOL!, K!, PRE, isolecto.].

**ILLUSTRATION:** Schelpe & Anthony: fig. 8, t. 5, 5a (1986).

Terrestrial, in seasonal and permanent pans and in shallow water courses, 50–800 m.

**DISTRIBUTION:** South Africa.

## Class FILICOPSIDA

Order OPHIOGLOSSALES *Prantl*, Lehrbuch der Botanik für Mittelschulen: 115, 119 (1874).

6. **OPHIOGLOSSACEAE** (*R.Br.*) *C.Agardh*, Aphorismi botanici 8: 113 (1822). *Ophioglosseae* *R.Br.*: 163 (1810) [unranked]. Type: *Ophioglossum* L.

Plants terrestrial, deciduous perennials, often clone forming by root proliferation. *Stems* siphonostelic, short, erect, subterranean; roots mycotrophic, fleshy, without root hairs, cortex parenchymatous. *Trophophore* lamina with a conduplicate vernation; with a pair of membranous stipules at the petiole base; lamina simple, glabrous, midribless; veins anastomosing, with included veinlets; hypostomatic, stomata of the anomocytic type. *Sporophore* simple, borne at the stipe base, or centrally at the base of the expanded part of the tropophore; aerophores absent. *Sporangia* sunken in the tissue on either side of a simple linear spike, thick-walled, dehisce along a single lateral line. *Spores* numerous, trilete, globose, 24–70 µm in diameter. *Gametophyte* subterranean, mycotrophic, cylindrical, regularly branched, fleshy, with a 4-sided meristematic cell, rhizoids all over, with simple hairs, gametangia restricted to the apical part; antheridia large, completely or partially embedded, with a 2–3-layered wall, cap cell small and triangular to

pentagonal; archegonium neck with 6–8 tiers of cells, vertical, neck canal cell binucleate. Chromosome number based on  $2n = 240$ , 480 and 960.

The Ophioglossaceae, represented by *Botrychium* Sw., dates back to the Palaeocene (Rothwell & Stockey 1989). The group is characterized by a stem with a sympodial primary vascular system, the presence of a vascular cambium, a periderm, circular bordered-pitted tracheids, axillary branching, often solitary sporangia, and the primordial leaf which has a non-circinate vernation (Kato 1988).

**0115200 OPHIOGLOSSUM L.**, Species plantarum 2: 1062 (1753). Lectotype: *Ophioglossum vulgatum* L., designated by J. Smith (1875).

*Rhizoglossum* C.Presl: 47 (1845b). *Ophioglossum* L. subgen. *Rhizoglossum* (C.Presl) R.T.Clausen: 163 (1938). Type: *Rhizoglossum bergianum* (Schltdl.) C.Presl; *Ophioglossum bergianum* Schltdl.

Generic description as for the family. A cosmopolitan genus of between 30 and 50 species. The classification followed here is conservative in that the subgenera recognized are often considered as distinct genera. Only subgenus *Ophioglossum* is present on the African subcontinent.

#### KEY TO THE SUBGENERA:

- 1a Plants always terrestrial; stems glabrous ..... 1. subgen. **Ophioglossum**
- 1b Plants epiphytic, rarely terrestrial; stems sparsely or densely paleated at the apex:
  - 2a Sporophore single, arising from near the centre of a linear sterile lamina ..... 2. subgen.s **Ophioderma**
  - 2b Sporophores several, arising from the margin at/or below the base of a sterile, palmately-lobed lamina ..... 3. subgen. **Cheiroglossa**

#### 1. Subgenus **Ophioglossum**

#### KEY TO THE SPECIES: - primarily based on Burrows (1997)

- 1a Sporophore arise independently from the stipe base:
  - 2a Trophophore linear or narrowly oblanceolate ..... 2. **O. bergianum**
  - 2b Trophophore ovate or elliptic ..... 12. **O. nudicaule**
- 1b Sporophore arises at or just below the base of the trophophore:
  - 3a Stem 6–16 mm in diameter, suborbicular ..... 5. **O. costatum**
  - 3b Stem < 6 mm in diameter, never suborbicular:
    - 4a Trophophore 1.5–7 mm long; sporophore:trophophore length ratio 7:1–30:1 ..... 17. **O. thomasii**
    - 4b Trophophore > 8 mm long; sporophore:trophophore length ratio less than 7:1:
      - 5a Trophophore approximately appressed to the ground or held less than 30% from the horizontal; stipe more than 50% buried:
        - 6a Trophophore broadly ovate, with a length:width ratio of 2:1 or less; stipe bases not persistent:
          - 7a Sporophore:trophophore length ratio > 6:1; spores with broad, flat-bottomed lumina ..... 4. **O. convexum**
          - 7b Sporophore:trophophore length ratio < 6:1; spores with thick rounded muri and narrow, conical lumina ..... 10. **O. latifolium**
        - 6b Trophophores narrowly ovate to elliptic, with a length:width ratio of 2:1 or more; stipe bases persistent:
          - 8a Stem often suborbicular; trophophores with a reddish or orange tinge, the proximal 2 or 4 areoles pale or translucent ..... 16. **O. rubellum**
          - 8b Stem ellipsoid to linear; trophophores lacking a reddish tinge or pale basal areoles:
            - 9a Sporophore arising from below  $\frac{3}{4}$  the way up the stipe; stem linear; trophophore usually appressed to the ground, the margins often undulate ..... 12. **O. nudicaule**
            - 9b Sporophore arising from the base of the trophophore; stem usually short, ellipsoid; trophophore usually held at the ground, the margins even ..... 6. **O. gomezianum**
  - 5b Trophophores held at more than 30% from the ground; stipe buried for 80% or less of its length:
    - 10a Stem often short, ellipsoid; stipe buried for 80% or more than its length ..... 6. **O. gomezianum**
    - 10b Stem fusiform to linear; stipe buried for < 70% of its length:
      - 11a Rhizome apex bearing numerous, persistent old stipe bases:
        - 12a Trophophore frequently a dull, semiglaucous green ..... 13. **O. polyphyllum**
        - 12b Trophophore green with an orange tinged median vein ..... 1. **O. ammophyllum**
      - 11b Rhizome lacking persistent stipe bases; trophophore bright to mid-green:
        - 13a Trophophore elliptic, oblanceolate or linear:
          - 14a Trophophore linear to linear-elliptic, 1.5–3 mm wide, slightly falcate ..... 8. **O. gracillimum**
          - 14b Trophophore elliptic, never linear, 3–13 mm wide, not falcate:
            - 15a Average trophophore length:width ratio of 3:1–5:1:
              - 16a Rhizome fusiform; roots descending; spores aleate ..... 9. **O. lancifolium**
              - 16b Rhizome linear; roots horizontal; spores trilete ..... 7. **O. gracile**.
            - 15b Average trophophore length:width ratio 4:1–9:1:
              - 17a Rhizome fusiform, roots descending; stipe usually longer than the trophophore; spore luminae reduced to narrow pits ..... 3. **O. caroticaule**
              - 17b Rhizome linear; roots horizontal; stipe usually shorter than the trophophore; spore luminae wide and often flat-bottomed ..... 11. **O. lusoaffricanum**
    - 13b Trophophore ovate to lanceolate:
      - 18a Trophophore length:width ratio 1.5:1 or less, the trophophore base truncate or cordate ..... 14. **O. reticulatum**
      - 18b Trophophore length:width ratio 1.5:1 or more, trophophore base cuneate:
        - 19a Trophophore length:width ratio commonly 3.5–7:1; spores with fine secondary muri descending into each lumen ..... 6. **O. gracile**
        - 19b Trophophore length:width ratio commonly 1.5–5.7:1; spores lacking secondary muri:

- 20a Trophophore length:width ratio commonly 1.5–4.7:1; sporophores with 6–64 pairs of sporangia ..... 18. *O. vulgatum*  
 20b Trophophore length:width ratio commonly 2.5–5.7:1; sporophores with 9–29 pairs of sporangia..... 15. *O. richardsiae*

1. **Ophioglossum ammophyllum** C.D.Adams in Annals and magazine of natural history, ser. 12, 7: 874 (1954). Type: Nigeria, Accra district, near Labadi, near Kapeshi lagoon, 23/05/1954, C.D. Adams GC4642 (BM, holo.; GC, K, iso.).

ILLUSTRATION: Adams: t. 28, 29 (1954).

Along the edges of seasonal pans in miombo woodland.

DISTRIBUTION: Ethiopia, Nigeria, Sudan, Zambia.

2. **Ophioglossum bergianum** Schldl., Adumbrationes plantarum: 10 (1825a); Sim: 236 (1892); Sim: 319 (1915); Jacobsen: 161 (1983); Schelpe & Anthony: 31 (1986); Burrows: 39 (1990). *Rhizoglossum bergianum* (Schldl.) C.Presl: 48 (1845b). Type: Provenient in Promontorio bonae spei ad radiced lateris occidentalis montis Leuweberg, Bergius s.n. (not located).

ILLUSTRATION: Schelpe & Anthony: t. 9, fig. 6, 7 (1986).

Terrestrial, mostly in shallow soils overlaying bedrock, seasonally moist and often in seepage areas, mostly in exposed conditions, 250–700 m.

DISTRIBUTION: South Africa.

3. **Ophioglossum caroticaule** J.E.Burrows in Bothalia 23: 186 (1993). Type: Zimbabwe: Gokwe Distr., Segwa Wildlife Research Area, Leguaan Vlei, 880 m, J.E. & S.M. Burrows 5153 (K, holo.; PRE, SRGH, iso.).

Terrestrial, in shallow soils in seasonally dry deciduous woodland.

DISTRIBUTION: Ethiopia, Kenya, South Africa, Tanzania, Zambia and Zimbabwe.

4. **Ophioglossum convexum** J.E.Burrows in Bothalia 19: 167 (1989); Burrows: 42 (1990). Type: South Africa, Transvaal, Lydenburg Distr., Coromandel Farm, montane grassveld, on shallow sandy soils overlaying quartzite, 1 875 m, 12/01/1985, J.E. Burrows 3683 (PRE, holo.; BOLI, K, iso.).

ILLUSTRATION: Burrows: t. 9, fig. 37 (1990).

Terrestrial, in seasonal seepage areas over bedrock, 1 500–2 000 m.

DISTRIBUTION: Malawi, South Africa, Zambia and Zimbabwe. Also in the Madagascan region.

5. **Ophioglossum costatum** R.Br., Prodromus florae Novae-Hollandiae et insulae Van-Diemen: 163 (1810); Schelpe (1977); Schelpe & Diniz: 31 (1979); Burrows: 48 (1990). Type: Nov. Holl.: Arnheim Bay, 14/02/1803, R. Brown Iter Austral. 118 [BM, lecto., designated by Pichi Sermolli (1954); K, isolecto.].

ILLUSTRATION: Schelpe: t. 8, fig. D (1970).

On seasonally moist streambanks and margins of vleis and pans in open savannah and deciduous woodland.

DISTRIBUTION: Angola, Benin, Botswana, Burundi, Cameroon, Central African Republic, Chad, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Ghana, Guinea, Kenya, Liberia, Malawi, Mali, Mozambique, Namibia, Nigeria, São Tomé, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Zambia and Zimbabwe. Also in Australia, India and Madagascar.

6. **Ophioglossum gomezianum** Welw. ex A.Braun, Filices africanæ: 176, 177 (1868); Schelpe: 34 (1977); Jacobsen: 160 (1983); Schelpe & Anthony: 33 (1986); Burrows: 43 (1990). Type: Angola, distr. Pungo Andongo. In pascuis breve herbidis juxta rivulos pr. Catete, 1857, Welwitsch 35 (BM, holo.; K, LISU, iso.).

ILLUSTRATION: Burrows: t. 9, fig. 43 (1990).

Terrestrial, in seasonally moist sands at the base of rock outcrops, and along seepage lines, 800–1 500 m.

DISTRIBUTION: Angola, Bioko, Burundi, Central African Republic, Côté d'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Malawi, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe. Also in India.

7. **Ophioglossum gracile** Pocock ex J.E.Burrows in Bothalia 25: 61 (1995). Type: Cape Peninsula, Table Mountain, Woodhead Reservoir, 2 000 ft, 30/06/1947, E. Esterhuysen 13915 (BOLI, holo.; GRA, NBG!, PRE, iso.).

Terrestrial, in seasonally moist sandy soils of the Western Cape mountains, 600–1 200 m.

DISTRIBUTION: South Africa.

8. **Ophioglossum gracillimum** Welw. ex Hook. & Baker, Synopsis filicum: 445 (1868); Burrows: 40 (1990). *Ophioglossum lusitanicum* L. var. *gracillimum* Welw. ex A.Braun: 177, 178 (1868). Type: Angola, distr. Pungo Andongo. In pascuis breve herbidis juxta ripas rupestres rivulorum prope Catete, 02/1857, Welwitsch 36 [BM, lecto., designated by Burrows (1993); K, LISU, isolecto.].

**ILLUSTRATION:** Burrows: t. 9, fig. 35 (1990).

Terrestrial, in seasonally moist soils along vleimagins and watercourses in deciduous woodland, 850–1 250 m.

**DISTRIBUTION:** Angola, South Africa and Zimbabwe.

9. **Ophioglossum lancifolium** C.Presl, Supplementum tentaminis pteridographiae: 50 (1845b). Type: Mauritius, *Aubert du Petit-Thouars s.n.* (PRC, holo.; P, iso.).

Terrestrial, in seasonally moist sandy soil in deciduous woodland.

**DISTRIBUTION:** Angola, Botswana, Ghana, Malawi, Namibia, South Africa, Tanzania, Zambia and Zimbabwe.

10. **Ophioglossum latifolium** (Prantl) J.E.Burrows in Bothalia 23: 188 (1993). *Ophioglossum gomezianum* Welw. ex A.Braun var. *latifolium* Prantl: 316 (1884); Schelpe: 34 (1977). Type: Based on *Ophioglossum gomezianum* Welw. ex A.Braun forma *latifolia* (Prantl) A.Braun, nom. nud. Angola, distr. Pungo Andongo. In pascuis breve herbis juxta rivulos pr. Catete, *Welwitsch* 32 [K, lecto., designated by Burrows (1993); BM, LISU, isolecto.].

Terrestrial, in shallow seasonally moist soils overlaying sheetrock, and in deciduous woodland, 800–1 300 m.

**DISTRIBUTION:** Angola, Democratic Republic of the Congo, Kenya, Nigeria, Sierra Leone, Tanzania, Zambia and Zimbabwe.

11. **Ophioglossum luso-africanum** Welw. ex Prantl in Berichte der Deutschen Botanischen Gesellschaft 1: 351 (1883). Type: Angola. Regio III. 2 400–3 800 ped. alt. Distr. Pungo Andongo, in decliviis apricis arenoso humosis (humo cum arena gneisica) montium editorum praesidii imprimis in editis de Pedra Cazella, *Welwitsch* 34 (B, holo.; BM, K, LISU, iso.).

*Ophioglossum lancifolium* sensu Schelpe & Anthony: 36 (1986).

**ILLUSTRATION:** Schelpe: t. 8, fig. C1–2 (1970).

Terrestrial, in montane grassland, 800–2 000 m.

**DISTRIBUTION:** Angola, Ethiopia, Kenya, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

12. **Ophioglossum nudicaule** L.f., Supplementum plantarum: 443 (1782); Burrows: 43 (1990). Type: Cap. B. Spei, *Thunberg s.n.* (LINN 1243.2!, holo.; UPS, iso.).

*Ophioglossum capense* Sw.: 308 (1803). Type: As for *O. nudicaule*.

*Ophioglossum capense* Schldt. var. *nudicaule* (L.f.) Schldt.: 9 (1825a), non *O. capense* Sw. (1803).

**ILLUSTRATION:** Schelpe & Anthony: t. 9, fig. 5 (1986).

Terrestrial, in seasonally moist soils of the Western Cape, among grasses and in low sclerophyllous scrub, 200–900 m.

**DISTRIBUTION:** South Africa.

13. **Ophioglossum polyphyllum** A.Braun, Flora azorica: 17 (1884); Launert: 2.1 (1969); Schelpe & Anthony: 33 (1986). Type: In arena deserti prope Djeddah, *Schimper* 984 (BM, holo.; G!, P, iso.).

*Ophioglossum capense* Schldt. var. *regulare* Schldt.: 9 (1925a), non *O. capense* Sw. (1803). *Ophioglossum regulare* (Schldt.) C.Ch.: 472 (1906). Type: Cape of Good Hope, *Mund & Maire s.n.* (K, ?syn.), *Bergius s.n.* (B, ?syn.).

**ILLUSTRATION:** Burrows: t. 10, fig. 42 (1990).

Terrestrial, widely distributed in various habitats, but absent from forests, 10–2 800 m.

**DISTRIBUTION:** Algeria, Angola, Botswana, Burundi, Democratic Republic of the Congo, Egypt, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Morocco, Mozambique, Namibia, Somalia, South Africa, Sudan, Tanzania, Uganda and Zimbabwe. Also in Macaronesia, Arabia and India.

14. **Ophioglossum reticulatum** L., Species plantarum 2: 1065 (1753); Launert: 2.2 (1969). Type: Haiti, Fond de Baudin, near Léogane, based on Plumier, C., *Traité des fougères de l'Amerique* t. 164 (1705), icon.

#### KEY TO THE SUBSPECIES:

Trophophores 1 or 2, rarely 3, trophophore length:width ratio <1.5:1, base truncate or cordate ..... 14.1. subsp. **reticulatum**  
Trophophores 3–6, trophophore length:width ratio 2.6–1.6:1, base cuneate ..... 14.2. subsp. **complicatum**

#### 14.1. subsp. **reticulatum**

**ILLUSTRATION:** Burrows: t. 10, fig. 41, 41a (1990).

Terrestrial, in submontane grassland and scrub, lightly shaded, 600–2 800 m.

**DISTRIBUTION:** Angola, Burundi, Cameroon, Chad, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Malawi, Mozambique, Namibia, Nigeria, São Tomé, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe. Also in South and

Central America and the Mascarene region.

14.2. subsp. **complicatum** (Miq.) J.E.Burrows, MS. *Ophioglossum moluccanum* Schltdl. forma *complicatum* Miq.: 290 (1868). *Ophioglossum reticulatum* L. forma *complicatum* (Miq.) Wieff.: 330 (1964). Type: Unknown.

**DISTRIBUTION:** Democratic Republic of the Congo, Malawi and Zimbabwe. Also in Japan and south-east Asia.

15. **Ophioglossum richardsiae** J.E.Burrows in *Bothalia* 29: 109 (1999). Type: Zambia, Northern Province, 24 km from Mbala (Abercorn), The Rocks, 4.8 km N of Kawimbe, 1 700 m, 26/02/1956, *McCallum-Webster* C8 (K, holo.).

**ILLUSTRATION:** Burrows: t. 12, fig. A & B, t. 13, fig. A–C (1999).

Terrestrial, in seasonally moist soils, exposed, 1 000–2 000 m.

**DISTRIBUTION:** Zambia and Tanzania.

16. **Ophioglossum rubellum** Welw. ex A.Braun, *Filices africanæ*: 179 (1868); Schelpe: 33 (1977); Burrows: 47 (1990). Type: Angola, distr. Pungo Andongo. In pascuis brevi herbis juxta ripas rivuli de Catete nec non prope Candumba ad flumen Cuanza, 1857, *Welwitsch* 33 (K, holo.; BM, LISU, iso.).

Terrestrial, in seasonally moist shallow soils in mixed deciduous woodland, 800–1 200 m.

**DISTRIBUTION:** Angola, Central African Republic, Ethiopia, Gabon, Ghana, Kenya, Malawi, Sierra Leone, South Africa, Tanzania, Uganda, Zambia and Zimbabwe.

17. **Ophioglossum thomasii** R.T.Clausen in *Mémoires of the Torrey Botanical Club* 19: 152 (1938); Burrows: 47 (1990). Type: Uganda, Kampala, Kabaka's Lake, locally frequent in swamp, 3 900 ft, 03/1938, *Chandler s.n.*, in *Thomas 1903* (BM, holo.; P, iso.).

**ILLUSTRATION:** Schelpe: t. 8, fig. B1 (1970).

Terrestrial, in shallow seasonally moist soils in short grasslands.

**DISTRIBUTION:** Cameroon, Côté d'Ivoire, Gabon, Liberia, Malawi, Nigeria, Uganda, Tanzania, Zambia and Zimbabwe.

18. **Ophioglossum vulgatum** L., *Species plantarum* 2: 1062 (1753). Type: Habitat in Europae protis sylvaticis, *Linneaus s.n.* in *Herb. Clifford 472*, *Ophioglossum 1* [BM, lecto., designated by Jonsell & Jarvis (1993)].

#### KEY TO THE SUBSPECIES:

- Trophophore narrowly ovate to lanceolate, trophophore length:width ratio 1.8–4.7:1; spores uniformly and smoothly reticulate ..... 18.1. subsp. **africanum**  
 Trophophore ovate, trophophore length:width ratio <1.8:1; spores with muri coalescing irregularly to form flattened areas ..... 18.2. subsp. **kilimandscharicum**

subsp. **vulgatum**

**DISTRIBUTION:** Europe and Asia.

18.1. subsp. **africanum** Pocock ex J.E.Burrows in *Bothalia* 23: 189 (1993). Type: South Africa, Natal, Bergville Distr., Cathedral Peak Forest Research Station, Catchment 9, 1 905 m, *Killick 1267* (NU, holo.; PRE, iso.).

#### KEY TO THE VARIETIES:

- Trophophore narrowly ovate to lanceolate, the length:width ratio 1.8–3.3:1; confined to areas above 1 800 m ..... 18.1.1. var. **africanum**  
 Trophophore narrowly elliptic to sublanceolate, the length:width ratio 3.0–4.7:1; confined to areas below 1 000 m ..... 18.1.2. var. **taylorianum**

18.1.1. var. **africanum**

**ILLUSTRATION:** Burrows: t. 10, fig. 40 (1990).

Terrestrial, in seasonally moist areas in deciduous woodland and montane grasslands.

**DISTRIBUTION:** Kenya, Malawi, South Africa, Tanzania, Zambia and Zimbabwe.

18.1.2. var. **taylorianum** J.E.Burrows in *Bothalia* 29: 110 (1999). Type: Tanzania, Songea Distr., by Likonde River, 750 m, 26/06/1956, *Milne-Redhead & Taylor 10905* (K, holo.; EA, iso.).

**ILLUSTRATION:** Burrows: t. 12, fig. C & D, t. 13, fig. D–F (1999).

**DISTRIBUTION:** Zimbabwe and Tanzania.

18.2. subsp. **kilimandscharicum** (Hieron.) J.E.Burrows in *Bothalia* 25: 62 (1995). *Ophioglossum vulgatum* L. var. *kilimandscharicum* Hieron.: 89 (1895). Type: Tanzania, Kilimanjaro, Kifinika Vulcano, 2 800 m, *Volkens 1161* [B†; BM, lecto., designated by Burrows (1995)].



Terrestrial, in seasonally moist submontane vegetation, exposed or partially shaded, 900–1 650 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Kenya, South Africa and Tanzania.

Order MARATTIALES *Prantl*, *Lehrbuch der Botanik für Mittelschulen*: 115, 119 (1874).

7. **MARATTIACEAE** *Bercht. & J.Presl*, *O Prirozenosti Rostlin* 1: 272 (1820), as 'Marattiae'. Type: *Marattia* Sw.

Plants terrestrial perennials. *Stems* siphonostelic, large, erect; roots fleshy, the cortical cells parenchymatous with scattered tanniferous cells and mucilage canals. *Fronds* numerous, caespitose; stipe siphonostelic, with 2 concentric rings of small (up to 24) vascular bundles, the inner ring adaxially sulcate, terete, with persistent fleshy stipules and a basal pulvinus; lamina to 2-pinnate, basiscopically developed; secondary rachis with a basal pulvinus, narrowly winged; pinnules sessile or short-stalked; hypostomatic, stomata tetracyclic; aerophores occur as scattered short lines laterally and abaxially along the stipe and rachis, and a continuous line ventral of the secondary rachis wing between the pinnules; veins simple or forked, free, catadromous. *Indumentum* composed of simple uniseriate or branched non-glandular hairs, and short-stalked, filiform, much branched paleae occurring along the axes. *Sorus* an elongate bivalved synangium, submarginal, mostly on the anadromous vein branches. *Spores* ellipsoid, monolete or trilete, rugate, to 37 µm long. *Gametophyte*: spore germination amorphous; prothallial development of the *Marattia*-type; mature thallus long-lived, massive, cordate, chlorophyllous, mycotrophic, glabrous, midrib elongate, broad, often branched, wings several cells thick along the midrib; rhizoids often septate; gametangia embedded; antheridia dorsally and ventrally, large, wall one cell layer thick, cap cell divided to form a triangular operculum; archegonium with a short projecting neck, with 3–4 tiers of cells, neck canal cell often divided; apogamy reported. Chromosome number based on  $2n = 156$ .

The Marattiales is a primitive group that dates back to the late Carboniferous period. During that time the Marattiaceae were tall graceful, heavily buttressed, trees with unbranched trunks (Andrews 1961). The group has no clear relatives. *Marattia* first appeared in the Triassic (Collinson 1996).

**0116600 MARATTIA** Sw., *Nova genera & species plantarum*: 8, 128 (1788). Type: *Marattia alata* Sw.

*Myriothea* Comm. ex Juss.: 15 (1789). Type: *Myriothea fraxinea* (Sm.) Poir.; *Marattia fraxinea* Sm.

Generic description as for the family. A pantropical genus of about 70 species, but is absent from mainland Asia.

***Marattia fraxinea* Sm.**, *Plantarum icones hactenus ineditae plerumque ad plantas in herbario Linneano conservatas delineata*: 2, t. 48 (1790); Sim: 235 (1892); Sim: 317 (1915); Schelpe: 38 (1977); Jacobsen: 167 (1983). *Myriothea fraxinea* (Sm.) Poir.: 404 (1798), as '*frascinea*'. Type: *Ile de France de l'herbier de Thouin no. 91. Herb. Smith* (LINN 1644.2, holo.).

*Marattia salicifolia* Schrad.: 920 (1818). *Marattia fraxinea* J.Sm. ex J.F.Gmel. var. *salicifolia* (Schrad.) C.Chr.: 67 (1932a); Schelpe: 40 (1970); Schelpe & Diniz: 32 (1979); Schelpe & Anthony: 37 (1986); Burrows: 49 (1990). Type: Prom. bon. spei, Hesse s.n. (LE, holo.).

*Marattia salicifolia* Schrad. var. *natalensis* Kunze: 79 (1842a). *Marattia natalensis* (Kunze) C.Presl: 9 (1845a). Type: In Höhlen der Wälder um P. Maritzburg bei Port Natal in September in der bezeichneten Abart von Hrn. Krauss (LZ, holo. t); In sylv. clivitiis prope P. Maritzburg, Natal, Sept. 39, *Krauss* 257 (LZ, holo. t; BM, Fl, K, iso.).

*Marattia dregeana* C.Presl: 9 (1845a). Type: Habitat in Capite bonae spei ad rivulum umbrosum vallis saxosae inter Omsamcaba catarractam majorem et Omsamwubo, *Drège* s.n. (?PRC, holo.; BM, K, L, W, iso.).

**ILLUSTRATION:** Fig. 3A–D; Schelpe: t. 9, fig. 1–3 (1970).

Terrestrial, along streams and damp depressions in moist evergreen forests, deeply shaded, 50–2 000 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Príncipe, Rwanda, São Tomé, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region and the palaetropics.

Order POLYPODIALES *A.B.Frank*, *Synopsis der Pflanzenkunde*, 2nd edn, 3: 1452, 1458 (1877), as 'Polypodiaceae'.

Suborder POLYPODIINEAE

8. **OSMUNDACEAE** *Bercht. & J.Presl*, *O Prirozenosti Rostlin* 1: 272 (1820). Type: *Osmunda* L.

Plants terrestrial perennials. *Caudex* siphonostelic, erect, massive, simple or branched, often arborescent, clothed by persistent stipe bases and roots; roots with a sclerenchymatous outer cortical layer, the inner cortical cells relatively thin-walled. *Fronds* numerous, caespitose, perennial or deciduous, the fertile fronds monomorphic or hemidimorphic; lamina 1-pinnate-pinnatifid to 2-pinnate; stipe with a C-shaped vascular bundle, proximally laterally winged, terete higher up; lamina pinnately compound, pinnae and pinnules articulated (non-functional) or not; hypostomatic, stomata of the anomocytic type; aerophores dorsolateral, forming a continuous line along the axes; veins free, catadromous, axes adaxially variously sculptured with ridges and sulci. *Indumentum* composed of simple or branched uniseriate hairs, hair-like paleae, and broad, entire paleae, the apical cell not differentiated or (in *Todea*) ending in a large ovoid, non-glandular cell, occurring along the axes. *Sporangia* borne along the veins, contiguous at maturity; sporangium short-stalk, stout; capsule large, with a poorly developed annulus on one side, dehiscing by a longitudinal slit. *Spores* numerous, spheroidal or

globose, trilete, chlorophyllous, tuberculate, to 70 µm long. *Gametophyte*: spore germination of the *Osmunda*-type; prothallial development of the *Osmunda*-type; mature thallus long-lived, large, cordate, chlorophyllous, glabrous, midrib thick, often branched, wings thick near the midrib; with rhizoids along the midrib, initially chlorophyllous, often septate; antheridia first formed, ventrally along the margins, massive, with up to 12 curved wall cells; archegonia massive, restricted to the lateral sides of the midrib, neck straight, neck canal cell binucleate. Chromosome number based on  $2n = 44$ .

Fossil evidence suggests that the Osmundaceae and its immediate ancestors formed part of the world's vegetation since the Permian (Andrews 1961). The Osmundaceae is a primitive and isolated group not closely related to the other ferns. In southern Africa fossil stems of *Osmundites* Unger, an extinct branch of the Osmundaceae, are known from the Lower Cretaceous (Schelpe 1955). Modern *Osmunda* existed since the Upper Cretaceous (Serbet & Rothwell 1999), whereas *Todea* has no fossil record.

#### KEY TO THE GENERA:

Sporangia on contracted apical fertile segments ..... 0117600 **Osmunda**  
Sporangia on non-contracted basal fertile segments ..... 0117700 **Todea**

**0117600 OSMUNDA** L., Species plantarum 2: 1063 (1753). Lectotype: *Osmunda regalis* L., designated by L  man (1825).

*Struthiopteris* Bernh.: 126 (1801), non Scop. (1760), nec Willd. (1809). Type: *Osmunda regalis* L., designated by Pichi Sermolli (1972a).

Plants terrestrial perennials. *Caudex* siphonostelic, erect, massive, simple or branched, clothed by a layer of persistent stipe bases. *Fronds* numerous, caespitose, evergreen or deciduous, fertile fronds hemidimorphic; lamina 2-pinnate, the fertile pinnae apical, strongly contracted, more complex than the sterile; stipe with a single C-shaped vascular bundle, proximally laterally winged, terete higher up; lamina pinnately compound, pinnae and pinnules articulated (non-functional); hypostomatic, stomata of the anomocytic type; aerophores absent; veins free, catadromous. *Indumentum* of simple or branched, uniseriate hairs occurring along the axes. *Sporangia* borne along the veins, contiguous at maturity, sporangium short-stalked, stout, capsule massive. *Spores* numerous, chlorophyllous, spheroidal, trilete, coarsely tuberculate. *Gametophyte* as for the family. Chromosome number based on  $2n = 44$ .

Three subgenera are recognized in the genus of approximately seven species. Only subgenus *Osmunda* characterized by 2-pinnate, evergreen or deciduous fronds that bear the fertile pinnae apically occurs on the African subcontinent.

#### Subgenus **Osmunda**

**Osmunda regalis** L., Species plantarum 2: 1065 (1753); Sim: 227 (1892); Sim: 310 (1915); Schelpe: 44 (1970); Schelpe: 43 (1977); Schelpe & Diniz: 40 (1979); Jacobsen: 169 (1983); Schelpe & Anthony: 43 (1986); Burrows: 49 (1990). *Struthiopteris regalis* (L.) Bernh.: 126 (1801). *Aphyllocalpa regalis* (L.) Lag.: 164 (1802). Type: *Herb. Burser* XX: 26 [UPS, lecto., designated by Jonsell & Jarvis (1993)].

*Osmunda capensis* C.Presl: 63 (1845b), non L. (1771a). *Osmunda regalis* L. var. *capensis* (C.Presl) Milde: 179 (1867). Type: Cape of Good Hope, Dr  ge s.n. (?PR, holo.).

*Osmunda schelpei* A.E.Bobrov: 6 (1968). Type: Natal, Ngome, 1937, *Getstner* 2339 (PRE, holo.).

*Osmunda transvaalensis* A.E.Bobrov: 7 (1968). Type: Transvaal, Entabeni Forest Reserve, 4 500 ft, 09/09/1947, *Codd* 3039 (PRE, holo.).

**ILLUSTRATIONS:** Fig. 3E–G; Schelpe: t. 10, fig. 1, 2 (1970).

In rock crevices in seasonally moist grassland, but mostly along perennial streams and moist ditches, exposed or partially shaded, 500–2 000 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Guinea, Kenya, Lesotho, Liberia, Malawi, Mali, Mozambique, Nigeria, Rwanda, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region and temperate Europe, Asia and America.

**0117700 TODEA** Willd. ex Bernh. in Journal f  r die Botanik 1800, 2: 126 (1801). Type: *Todea africana* Willd. ex Bernh., nom. illeg. (now *Todea barbara* (L.) T.Moore; *Acrostichum barbarum* L.).

Plants terrestrial. *Stem* siphonostelic, mostly unbranched, forming a massive upright caudex, covered by a thick layer of persistent stipe bases and roots. *Fronds* numerous, caespitose; stipe laterally winged at the base; lamina pinnately compound, monomorphic, catadromous, glabrous or with indumentum along the axes; hypostomatic, stomata of the anomocytic type; venation free, generally once forked, catadromous. *Indumentum* of unbranched uniseriate hairs, narrow hair-like paleae and broad, entire paleae, the apices of which terminate in a large ovoid, non-glandular cell. *Sporangia* massive, with a thick short stalk, confined to the not conspicuously contracted basal pinnae and pinnules, on all parts of the veins, appear acrostichoid at maturity. *Spores* numerous, chlorophyllous, globose, tetrahedral, coarse baculate or tuberculate. *Gametophyte* as for the family. Chromosome number based on  $2n = 44$ .

*Todea* is a genus of two species, namely *T. barbara* (L.) T.Moore and *T. papuana* Hennipm., the latter being confined to New Guinea.

**Todea barbara** (L.) T.Moore, Index filicum: cxix, 7 (1857); Sim: 228 (1892); Sim: 309 (1915); Schelpe: 46 (1970); Schelpe & Diniz: 41 (1979); Jacobsen: 170 (1983); Schelpe & Anthony: 45 (1986); Burrows: 50 (1990). *Acrostichum barbarum* L.: 1072 (1753). *Osmunda barbara* (L.) Thunb.: 171 (1800). Type: Habitat in Africa, *Adair* s.n. *Herb. Sloane* (BM, holo.).

*Todea africana* Willd.: 14 (1802), nom. illeg.

**ILLUSTRATION:** Fig. 3H; Schelpe: t. 11, fig. 1–3 (1970).

Along perennial streams in montane regions, exposed or in light shade, 50–1 800 m.

**DISTRIBUTION:** Mozambique, South Africa, Swaziland and Zimbabwe. Also in Australia and New Zealand.

**GLEICHENIACEAE** (*R.Br.*) *C.Presl*, *Reliquiae haenkeanae* 1: 70 (1825), as '*Gleicheniae*'. *Filices tribus Gleichenae* R.Br.: 160 (1810). Type: *Gleichenia* J.Sm.

*Dicranopteridaceae* Ching: 94 (1954). Type: *Dicranopteris* Bernh.

Plants terrestrial or epilithic. *Rhizome* protostelic; widely creeping, branched. *Roots* with an outer sclerenchymatous cortical layer, the inner cortical cells relatively thin-walled. *Fronds* widely spaced, dorsal, uniseriate, scandent, with indeterminate growth; stipe with a single C-shaped stele; terete; lamina pseudo-dichotomously branched, catadromous; rachis somewhat flattened adaxially, with an arrested bud between the bifurcations, often with pseudo-stipules, in *Dicranopteris* with a pair of accessory branches at the forks; pinnae unbranched or several times pseudo-dichotomously branched, ultimate branches pinnatifid or 1-pinnate, segments broadly attached, herbaceous to coriaceous; hypostomatic, stomata of the anomocytic and diacytic types; venation free, forked, catadromous. *Indumentum* composed of stellate and branched hairs, and fimbriate paleae confined to the rhizome and frond axes. *Sori* circular, superficial or immersed, on acroscopic vein branches, with 2–15 sporangia per sorus, exindusiate. *Sporangium* stalk multiseriate; annulus oblique, complete. *Spores* numerous, monolete or trilete, if tetrahedral then with prolonged angles, shallowly rugulate, often foveolate, to 48 µm long. *Gametophyte*: spore germination of the *Gleichenia*-type; prothallial development of the *Drynaria*-type; mature thallus long-lived, cordate, with a thickened (often branched) midrib and uplifted undulating wings; rhizoids initially chlorophyllous; indumentum composed of 2-celled clavate, glandular hairs with a large tannin containing apical cell occurring dorsally and ventrally on the midrib and wings; antheridium massive, the wall pluricellular, composed of 10 narrow twisted cells and a small cap cell; archegonium massive, neck with up to 10 tiers of cells, directed towards the anterior or straight, neck canal cell binucleate. Chromosome number based on  $2n = 68, 78$  and 156.

*Oligocarpia* Goeppert, a fossil genus from the Upper Carboniferous and Permian, is often considered to be the earliest member of the family Gleicheniaceae (Abbott 1954; Wang *et al.* 1999). Taylor & Taylor (1993), however, placed the genus in the now extinct family Sermeyaceae; a family characterized by sporangia that have two rows of cells in the oblique annulus rather than one. Wang *et al.* (1999) showed that *O. kepingensis* from the Lower Permian in China, has many features in common with the extant Gleicheniaceae and suggest that they are closely related. The first conclusive gleicheniacean fossils date from the Cretaceous (Seward 1926). Pichi Sermolli (1958a) suggested the gleichenioid ferns as a branch of the forerunners of the schizaeoid ferns rather than having originated from a common ancestor. Following Holttum (1957), two subfamilies are recognized with only subfamily *Gleichenioideae* being represented on the African subcontinent. The monotypic subgenus *Stromatopteridoideae* Nakai, often treated as an independent family, is confined to New Caledonia.

#### KEY TO THE SUBFAMILIES:

- Lamina pinnate; fronds borne on erect stem branches; venation anadromous ..... 2. subfam. **Stromatopteridoideae**  
 Lamina at least once forked, pectinate-pinnatifid or pectinate-pinnate above the fork(s); fronds borne directly on the horizontal stem; venation catadromous ..... 1. subfam. **Gleichenioideae**

Subfamily **Gleichenioideae**, Nakai in Bulletin of the National Science Museum (Tokyo) 29: 32 (1950). Type: *Gleichenia* Sm.

#### KEY TO THE GENERA:

- Veins once forked; indumentum composed of stellate hairs and fimbriate paleae ..... 0118700 **Gleichenia**  
 Veins forked more than once; indumentum composed of branched hairs only, paleae absent ..... 0118800 **Dicranopteris**

**0118700 GLEICHENIA** Sm. in Mémoires de l'Académie des Sciences de Turin 5: 419, t. 9, fig. 10 (1793), nom. cons. Type: *Gleichenia polypodioides* (L.) Sm.; *Onoclea polypodioides* L.

Plants terrestrial or epilithic. *Rhizome* protostelic, widely creeping, branched. *Fronds* widely spaced, dorsal, uniseriate, scandent, with indeterminate growth; stipe with a single almost closed C-shaped stele, terete; lamina pseudo-dichotomously branched, catadromous; rachis somewhat flattened adaxially, with an arrested bud between the bifurcations; pinnae unbranched or several times pseudo-dichotomously branched; ultimate branches pinnatifid; segments broadly attached, herbaceous to coriaceous; hypostomatic, stomata of the anomocytic and diacytic types; venation free, once forked, catadromous. *Indumentum* composed of stellate hairs and fimbriate paleae confined to the rhizome and frond axes. *Sori* circular, superficial or immersed, on acroscopic vein branch, with 2–14 sporangia per sorus, exindusiate. *Sporangium* stalk multiseriate; annulus oblique, complete. *Spores* numerous, monolete or trilete, if tetrahedral then with prolonged angles, shallowly rugulate, to 48 µm long. Chromosome number based on  $2n = 68$ .

A genus of about 30 palaeotropical and austral species divided into three subgenera. Two subgenera are present on the African subcontinent.

#### KEY TO THE SUBGENERA:

- Ultimate branches pinnate; ultimate segments 1–3 mm long and wide; spores trilete ..... 1. subgen. **Gleichenia**  
 Ultimate branches deeply pinnatifid; ultimate segments 5–45 mm long; spores monolete ..... 2. subgen. **Mertensia**

#### 1. Subgenus **Gleichenia**

#### KEY TO THE SPECIES:

- Sori borne superficially on the ultimate segments ..... 1. **G. elongata**  
 Sori sunken into tissue of ultimate segments ..... 2. **G. polypodioides**

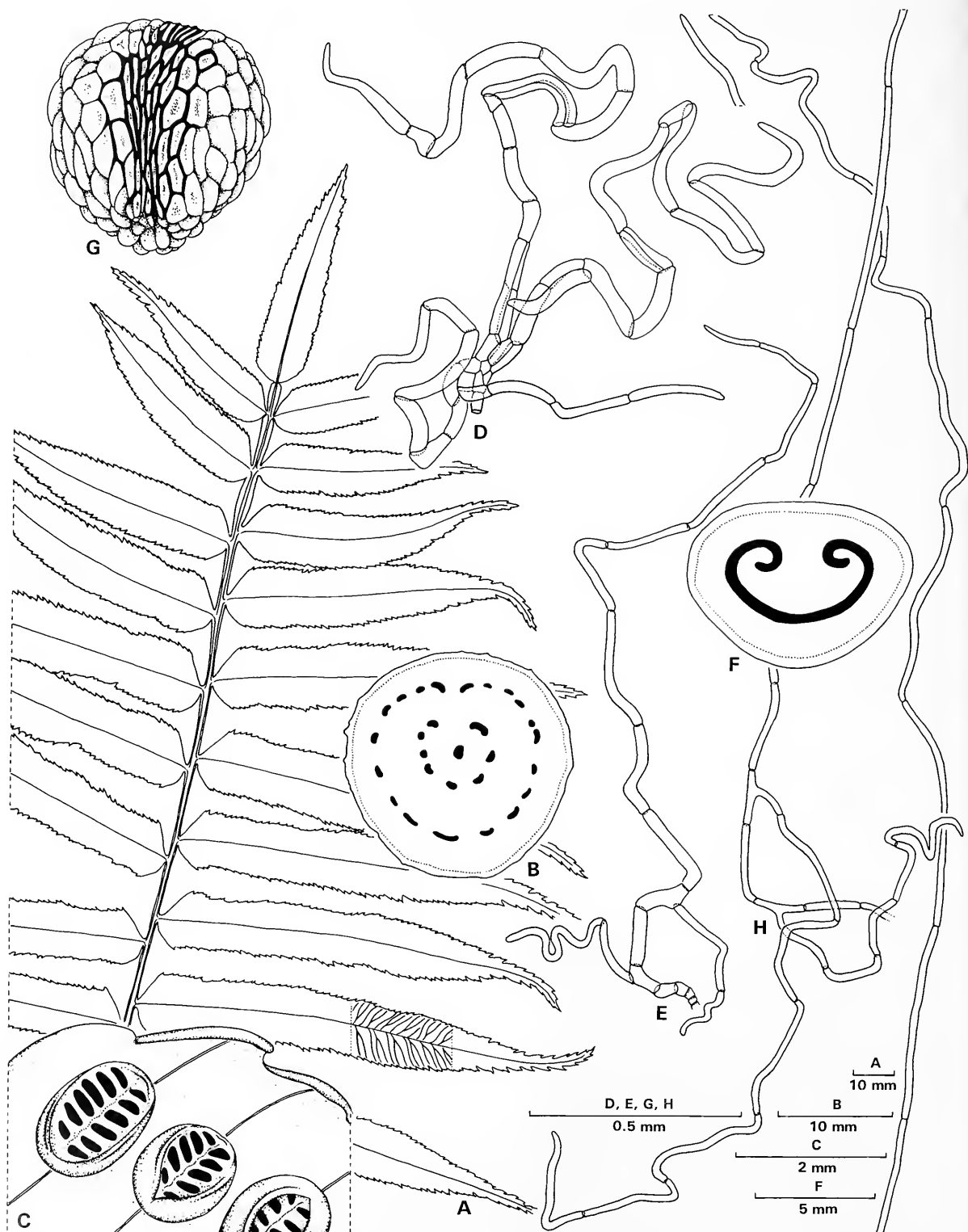


FIGURE 3A–H, Marattiaceae and Osmundaceae. A–D, *Marattia fraxinea*, A, pinna, *Schultz 132* (NBG); B, cross-section of the stipe, ex hort.; C, synangia, *Rudatis 686* (NBG); D, rachis palea, *Macfarlane 1* (NBG); E–G, *Osmunda regalis*, E, stipe hair; F, cross-section of the stipe; G, sporangium, E & G from *Dlamini s.n.* (NBG); H, *Todea barbara*, stipe hair, *Roux 693* (NBG). Scale bars: A, 10 mm; B, 10 mm; C, 2 mm; D, E, G, H, 0.5 mm; F, 5 mm.

1. **Gleichenia elongata** Baker in Kew Bulletin 1901: 137 (1901); Schelpe: 48, t. 12 (1970). Type: Uganda, Ruwenzori, amongst heather, Butagu, 8 000–10 000 ft, *Scott-Elliot 8011* (K, holo.).

*Gleichenia ruwenzoriensis* Brause: 36 (1910). Type: Ruwenzori-West: Butagu-Tal, Ericaceen-Buschwald im Sphagnumteppich mit sehr festen Rhizomen kriechend, ca. 3 200 m ü. M., 02/1908, *Mildbraed 2564* (B 121845, holo.; B 121846–121848, iso.).

**ILLUSTRATION:** Schelpe: t. 12, fig. 3 (1970).

Terrestrial, moist streambanks, in light shade, 1 700–2 600 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Kenya, Malawi, Rwanda, Tanzania and Uganda.

2. **Gleichenia polypodioides** (L.) Sm. in Mémoires de l'Académie des Sciences de Turin 5: 419, t. 9, fig. 10 (1793); Sim: 43 (1892); Sim: 296 (1915); Schelpe: 48 (1970); Schelpe: 44 (1977); Schelpe & Diniz: 43 (1979); Jacobsen: 182 (1983); Schelpe & Anthony: 47 (1986); Burrows: 52 (1990). *Onoclea polypodioides* L.: 306 (1771b). *Calymella polypodioides* (L.) Ching: 288 (1940b). Type: Habitat ad Cap b. spei in fissuris rupium summorum montis Tabularis, Koenig 44 (missing).

*Gleichenia argentea* Kaulf.: 36 (1824). Type: Habitat in Promontorio bonae spei, *Chamisso s.n.* (?LE, holo.; ?HAL 81865, iso.).

*Gleichenia glauca* Sw.: 165, 393 (1806). Type: Loco incerto, *sine coll. s.n.* (S, holo.).

*Gleichenia glauca* Sw. var. *β nudiuscula* Kunze: 490 (1836). Type: Ad Kromrivier, in valle humida umbrosa, secus rivum, 400–800 p., 1838, *Drège s.n.* [BM!, lecto., designated by Roux (1986); L!, isolecto.].

**ILLUSTRATIONS:** Fig. 4A–F; Burrows: t. 11, fig. 49, 49a, b (1990).

In crevices on moist cliff faces, and along streambanks and forest margins, often becoming invasive in plantations, exposed or deeply shaded, 50–2 100 m.

**DISTRIBUTION:** Angola, Burundi, Lesotho, Malawi, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe. Also in the Madagascan region.

2. Subgenus **Mertensia** (Willd.) Hook., Species filicum 1: 6 (1844), p.p. *Mertensia* Willd.: 163 (1804a), p.p., non Roth (1797). Type: *Gleichenia truncata* (Willd.) Spr.; *Mertensia truncata* Willd.

**Gleichenia umbraculifera** (Kunze) T.Moore, Index filicum: 384 (1862); Sim: 44 (1892); Sim: 298 (1915); Schelpe: 50 (1970); Jacobsen: 183 (1983); Schelpe & Anthony: 48 (1986); Burrows: 52 (1990). *Mertensia umbraculifera* Kunze: 114 (1844b). *Sticherus umbraculiferus* (Kunze) Ching: 285 (1940b). Type: Ad ripam graminosam Omnaroti fluvii prope domicil. Hans de Lange in portu Natalensi, 02/1842, *Gueinzus s.n.* (LZ+).

**ILLUSTRATION:** Burrows: t. 11, fig. 50, 50a, b (1990).

Terrestrial or epilithic, in seasonally or permanently moist conditions at boulder based, on cliff faces, and along streambanks, forest margins and roadcuttings, 1 000–1 850 m.

**DISTRIBUTION:** South Africa, Swaziland, Tanzania and Zimbabwe.

**0118800 DICRANOPTERIS** Bernh. in Neues Journal für die Botanik 1: 38 (1806), nom. nov. for *Mertensia* Willd., non Roth (1797). Type: *Dicranopteris dichotoma* (Thunb.) Bernh.; *Polypodium dichotomum* Thunb. (now *Dicranopteris linearis* (Burm.f.) Underw.; *Polypodium lineare* Burm.f.).

*Mesosurus* Hassk.: 2 (1856). Lectotype: *Mesosurus dichotomus* (Thunb.) Hassk.; *Polypodium dichotomum* Thunb., nom. nov. for *Mertensia* Willd. non Roth (1797), designated by Pichi Sermolli (1972a).

Plants terrestrial or epilithic. *Rhizome* protostelic, widely creeping, branched. *Fronde*s widely spaced, dorsal, uniseriate, scandent, with indeterminate growth; stipe with a single C-shaped stele, terete; lamina pseudo-dichotomously branched, catadromous; rachis somewhat flattened adaxially, with an arrested bud bearing pseudo-stipules between the bifurcations, with a pair of accessory branches at the forks; pinnae several times pseudo-dichotomously branched; ultimate branches pinnatifid, segments broadly attached, herbaceous to coriaceous; hypostomatic, stomata of the anomocytic and diacytic types; venation free, once forked, catadromous. *Indumentum* composed of branched hairs confined to the rhizome and frond axes. *Sori* circular, superficial, on the acroscopic vein branches, with 8–15 sporangia per sorus, exindusiate. *Sporangium* stalk multiseriate, annulus oblique, complete. *Spores* numerous, trilete, tetrahedral with prolonged angles, rugulate, foveolate, to 45 µm long. *Gametophyte*: unknown. Chromosome number based on  $2n = 78$  and 156.

A genus of about 12 species with a pantropical and austral distribution. Two subgenera are recognized, subgenus *Dicranopteris* being characterized by the presence of basiscopic accessory branches at the base of each branch at a fork.

Subgenus **Dicranopteris**

**Dicranopteris linearis** (Burm.f.) Underw. in Bulletin of the Torrey Botanical Club 34: 250 (1907); Schelpe: 50 (1970); Schelpe: 46 (1977); Schelpe & Diniz: 44 (1979); Jacobsen: 184 (1983); Schelpe & Anthony: 49 (1986); Burrows: 54 (1990). *Polypodium lineare* Burm.f.: 235 (1768). *Gleichenia linearis* (Burm.f.) C.B. Clarke: 428 (1880); Sim: 299 (1915). *Mertensia linearis* (Burm.f.) Fritsch: 1092 (1901). Type: Habitat in Java, 1758, *H. v. Santen s.n.* [G-DELI, lecto., designated by Schelpe & Anthony (1986)].

var. **linearis**

**ILLUSTRATIONS:** Fig. 4G–I; Schelpe: t. 13, fig. 1–3 (1970).

Terrestrial or epilithic, thicket-forming on moist streambanks, along forest margins and disturbed sites such as road cuttings, exposed or shaded, 800–1 950 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Pemba, Príncipe, Rwanda, São Tomé, Sierra Leone, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zanzibar and Zimbabwe. Also in the Madagascar region, pantropical.

Holttum (1957) recognizes 11 varieties all being confined to south-eastern Asia.

10. **HYMENOPHYLLACEAE** Link, Handbuch zur Erkennung der nutzbarsten und am häufigsten vorkommenden Gewächse 3: 36 (1833a), as 'Hymenophylleae'. Type: *Hymenophyllum* Sm.

*Trichomanaceae* G.Kunkel: 155 (1965). Type: *Trichomanes* L.

Plants terrestrial, epilithic or epiphytic. *Rhizome* protostelic, widely creeping to short and suberect, irregularly branched, also with short adhesive hairs; roots with an outer parenchymatous cortex, the inner cortex sclerenchymatous; (rarely) absent or widely spaced. *Fronds* monomorphic, widely spaced or approximate, uniseriate or caespitose; stipe with a single circular stele; obsolete or distinct, terete, narrowly winged distally or along the entire length; lamina unistratose, irregularly divided or pinnately compound; ultimate segments one-veined; rachis winged or not; estomate; venation free, anadromous or catadromous, often with false veinlets. *Indumentum* composed of unicellular trichomes, simple uniseriate, acicular hairs that are basally, or ventrally attached, and stalked stellate hairs occurring on the rhizome, frond axes and rarely on the lamina surfaces. *Sori* terminal on the veins, solitary, at the apex of the ultimate segments, involucre cup-shaped or deeply 2-cleft, the mouth dilated or truncate, receptacles ending a vein, short or long, often extruding. *Sporangia* short-stalked, maturing basipetally; annulus oblique, complete, with 16–20 indurated annulus cells, dehiscence irregularly. *Spores* chlorophyllous, spheroidal, trilete, papillate or echinate, 11–76 µm in diameter. *Gametophyte*: spore germination of the *Hymenophyllum*-type; prothallial development of the *Kaulinia*-type; mature thallus unistratose, filamentous or taeniform, often profusely branched, glabrous, often with a discontinuous marginal archegonial cushions, rhizoids short, frequently branched, in marginal clusters; antheridia in marginal or submarginal groups, small, composed of a few oblique cells, basal region with 2–3 wedge-shaped cells; archegonia on specialised archegoniophores, neck straight, with 6–9 tiers of cells, neck canal cell binucleate; apogamy reported; vegetative reproduction by spindle- or barrel-shaped gemmae. Chromosome K.Iwats. number based on  $2n = 22, 26, 56, 66, 68, 72, 136$  and 144.

The Hymenophyllaceae is a primitive, yet specialized group of plants that, because of its marginal sori, probably derived from a schizaeoid ancestor. Following the classification of Iwatsuki (1984) the family is divided into two subfamilies. Only subfamily *Hymenophylloideae* is present on the African subcontinent. Subfamily *Cardiomanioideae* K.Iwats. is monotypic and *Cardiomanes reniforme* (G.Forst.) C.Presl is confined to New Zealand.

#### KEY TO THE SUBFAMILIES:

- Rhizome thin, widely creeping; fronds simple to pinnately compound, never reniform, membranous; involucre cylindrical or bivalvate, receptacle short or elongate, extruding or not ..... 1. subfam. **Hymenophylloideae**  
 Rhizome robust, widely creeping; fronds simple, reniform, coriaceous; involucre cylindrical, slightly sunken into lamina, receptacle extruding ..... 2. subfam. **Cardiomanioideae**

#### 1. Subfamily **Hymenophylloideae**

#### KEY TO THE GENERA:

- 1a Venation catadromous ..... 0124600 **Trichomanes**  
 1b Venation anadromous:  
 2a Fronds bearing stellate hairs ..... 0124200 **Sphaerocionium**  
 2b Fronds not bearing stellate hairs:  
 3a Involucre bivalvate throughout or to the middle; those with a conic involucre and bilabiate mouth have serrate margins or lobes ..... 0124000 **Hymenophyllum**  
 3b Involucre tubular or conic, with a truncate apex, or with two lips about half the length of the involucre; those with bilabiate involucre bear entire segments with false veinlets:  
 4a Rhizome long-creeping or short but slender; plants epiphytic, epilithic, or rarely terrestrial ..... 0124400 **Crepidomanes**  
 4b Rhizome erect, or when creeping then short and thick; terrestrial or epilithic ..... 0124800 **Cephalomanes**

**0124000 HYMENOPHYLLUM** Sm. in Mémoires de l'Académie des Sciences de Turin 5: 418, t. 9, fig. 8 (1793). Lectotype: *Hymenophyllum tunbridgense* (L.) Sm.; *Trichomanes tunbridgense* L., designated by Presl (1843).

*Hymenophyllum* Sm. subgen. *Mecodium* Copel.: 93 (1937). *Mecodium* (Copel.) Copel.: 17 (1938). Type: *Hymenophyllum polyanthos* (Sw.) Sw.

Plants terrestrial, epilithic or epiphytic. *Rhizome* widely creeping, irregularly branched, with few scattered roots. *Fronds* widely spaced; stipe terete, often narrowly winged distally; lamina unistratose, pinnately compound, glabrous or with a few small trichomes along the axes; ultimate segments with a single vein; rachis often winged; estomate; venation free, anadromous, without false veinlets.

*Indumentum* composed of small unicellular trichomes and/or basally, or ventrally attached, simple, uniseriate acicular hairs occurring on the rhizome and frond axes. *Sori* at the apex of the ultimate segments, involucre deeply 2-cleft, receptacle included or extruding. Spores spheroidal, trilete, papillate or echinate, 30–76 µm in diameter. *Gametophyte*: mature thallus unistratose, taeniform, often profusely branched, glabrous, with discontinuous marginal archegonial cushions; rhizoids short, frequently branched, in marginal clusters; antheridia in marginal or submarginal groups, the basal region with 2 or 3 wedge-shaped cells; archegonia on specialized archegoniophores, neck with 6–9 tiers of cells, neck canal cell binucleate; apogamy reported; vegetative reproduction by spindle- or barrel-shaped gemmae. Chromosome number based on  $2n = 22, 26$  and  $56$ .

A genus of about 250 species occurring throughout the tropics and temperate parts of the world. The genus is divided into four subgenera, two of which occur on the African subcontinent.

#### KEY TO THE SUBGENERA:

- Margin of segments entire, toothed, or dentate; internal cell walls coarsely pitted; receptacle long extruding ..... 1. subgen. **Hymenophyllum**  
 Margin of segments entire or crisped; internal cell walls straight; receptacle included ..... 2. subgen. **Mecodium**

#### 1. Subgenus **Hymenophyllum**

The subgenus is divided into two sections of which only section *Hymenophyllum* is represented on the African subcontinent.

#### Section **Hymenophyllum**

#### KEY TO THE SPECIES:

- Lamina oblong; pinnae (mostly) acroscopically divided; involucre lobes entire to toothed ..... 1. **H. peltatum**  
 Lamina ovate; pinnae divided on both sides; involucre lobes dentate ..... 2. **H. tunbridgense**

1. **Hymenophyllum peltatum** (Poir.) Desv. in *Mémoires de la Société Linnéenne de Paris* 6: 333 (1827); Jacobsen: 195 (1983); Schelpe & Anthony: 77 (1986); Burrows: 98 (1990). *Trichomanes peltatum* Poir.: 76 (1808). Type: Habitat in insulae Borboniae montibus mille orgas supra mare elevatis, ad rupes humidus, *Bory de St. Vincent s.n.* (P!, holo.).

*Hymenophyllum meyeri* C.Presl: 31, 50 (1843). Type: Cape Province, Worcester, Du Toits Kloof, *Drège s.n.*, β, p.p. (?PR, holo.; BM, S, iso.).

*Hymenophyllum uncinatum* Sim: 81 (1915). Type: Table Mountain, Cape Town, 12/1891, *Kässner 1007* (PRE, holo.).

**ILLUSTRATION:** Burrows: t. 20, fig. 98, 98a (1990).

Epilithic or epiphytic, mostly in permanently moist montane environments, deeply shaded conditions along streams, at waterfalls, and cliff faces in forests, 50–2 000 m.

**DISTRIBUTION:** Kenya, South Africa, Tanzania, Uganda and Marion and Prince Edward Islands. Widespread in the temperate parts of both hemispheres.

2. **Hymenophyllum tunbridgense** (L.) Sm., *English botany*: 3, t. 162 (1794); Sim: 50 (1892); Sim: 79 (1915); Schelpe: 80 (1970); Schelpe & Diniz: 82 (1979); Jacobsen: 194 (1983); Schelpe & Anthony: 78 (1986); Burrows: 97 (1990). *Trichomanes tunbridgense* L.: 1098 (1753), as '*tunbridgense*'. Type: Habitat in Anglia, Italia. Uncertain; LINN 1253.4, pt., and 1253.5 are this species but, according to Jackson (1912), were added to LINN after 1753, several illustrations also cited.

*Hymenophyllum dregeanum* C.Presl: 32, 52 (1843). Type: Cape Province, Cape Peninsula, Table Mountain, *Drège s.n.*, (, p.p. (?PR, holo.; L, iso.).

**ILLUSTRATIONS:** Fig. 5A & B; Burrows: t. 20, fig. 97, 97a, b (1990).

Terrestrial, epilithic or epiphytic, on deeply shaded boulders along streams, cliff faces, waterfalls and earth banks, or low-level epiphytes in montane or forest environments, 300–2 450 m.

**DISTRIBUTION:** Gabon, Kenya, Malawi, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe. Also in the Madagascan region, Macaronesia, and western and southern Europe.

2. Subgenus **Mecodium** Copel. in *Philippine Journal of Science* 64: 93 (1937). Type: *Hymenophyllum polyanthos* (Sw.) Sw.; *Trichomanes polyanthos* Sw.

Iwatsuki (1984) divided the subgenus into five sections. All the African species belong to section *Mecodium*.

#### KEY TO THE SPECIES:

- 1a Fronds orbicular to flabellate ..... 4. **H. sibthorpioides**  
 1b Fronds linear, ovate or narrowly ovate:  
 2a Pinnae mostly with less than 20 lobes ..... 1. **H. capense**  
 2b Pinnae mostly with more than 20 lobes:  
 3a Rhizome set with persistent ventrally attached acicular hairs ..... 2. **H. kuhnii**  
 3b Rhizome without ventrally attached acicular hairs ..... 3. **H. mossambicense**

1. **Hymenophyllum capense** Schrad. in *Göttingische gelehrte Anzeigen* 1818: 919 (1818); Schelpe: 79 (1970); Schelpe & Diniz: 81 (1979); Jacobsen: 193 (1983); Schelpe & Anthony: 78 (1986); Burrows: 96 (1990). *Mecodium capense* (Schrad.) Pic.Serm.: 404

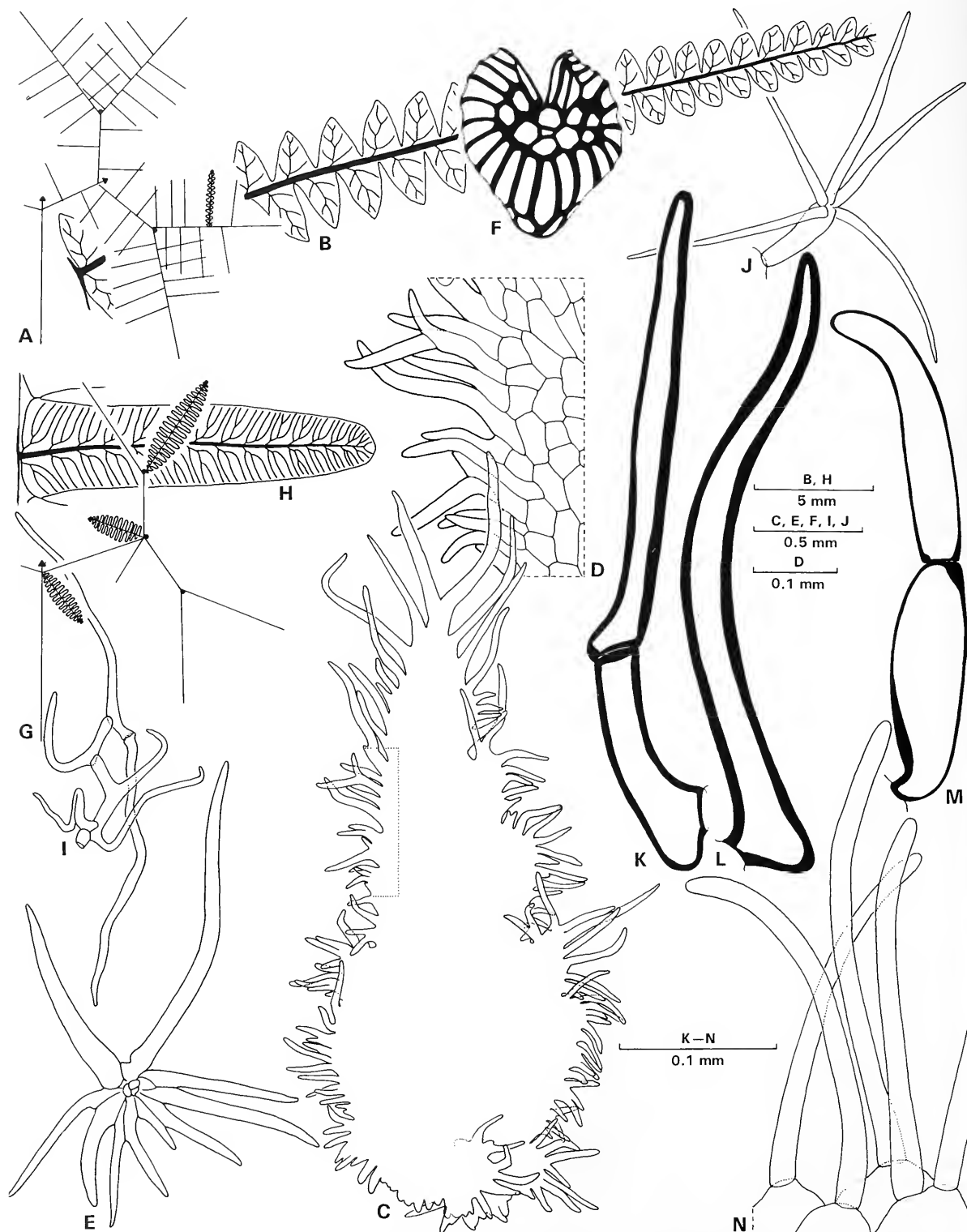


FIGURE 4A–M, Gleicheniaceae and Hymenophyllaceae. A–F, *Gleichenia polypodioides*, A, diagram illustrating the frond morphology; B, ultimate branch, Roux 82 (NBG); C, stipe palea; D, detail of the palea margin; E, stellate hair from the rhizome, Roux 821 (NBG); F, sporangium, C, D & F from Roux 2360 (NBG); G–I, *Dicranopteris linearis*; G, diagram illustrating the frond morphology; H, ultimate branch segment; I, axis hair; H & I from Compton 25953 (NBG); J, *Sphaerocionium aeruginosum*, stellate hair, Roux 74 (NBG); K & L, *Hymenophyllum capense*, rhizome hairs, Roux 2354 (NBG); M & N, *Crepidomanes melanotrichum*, M, rhizome hair; N, adhesive hairs, Roux 889 (NBG). Scale bars: B, H, 5 mm; C, E, F, I, J, 0.5 mm; D, 0.1 mm; K–N, 0.1 mm.



(1972b). Type: e Cap b. Sp., *M. Hesse s.n.* (GOET, holo.).

*Hymenophyllum thunbergii* Eckl. ex C.Presl: 32 (1843), nom. nud. Type: e Cap b. Spei, *M. Hesse s.n.* (GOET!, holo.).

*Hymenophyllum natalense* Bosch: 286 (1859). Type: Port Natal, *Gueinzus s.n.* (K, syn.); Kleyn River, *Zeyher s.n.* (K, syn.); Genadenthal, *Breutel s.n.* (K, syn.).

*Hymenophyllum zeyheri* Bosch: 388 (1859). Type: South Africa, *Zeyher s.n.* (K, holo.).

*Hymenophyllum tabulare* Bosch: 397 (1859). Type: Cape Province, Tafelberg, Duivelsberg, Hollandsberg, *Ecklon s.n.* (K, syn.); *Zeyher s.n.* (K, P, syn.); *Drège s.n.* (K, syn.).

*Hymenophyllum rarum* sensu Sim: 47 (1892).

*Hymenophyllum fumarioides* sensu Sim: 74 (1915).

**ILLUSTRATION:** Fig. 4K & L.

Epilithic or low-level epiphytes, mostly in permanent or seasonally moist, deeply shaded conditions in forests, on boulders along streams, at waterfalls and seepage areas on cliffs, rarely also in exposed conditions in shallow soil-filled pockets on rocks, 150–1 900 m.

**DISTRIBUTION:** Malawi, Mozambique, South Africa, Tanzania and Zimbabwe. Also in Madagascar.

2. ***Hymenophyllum kuhnii*** C.Chr., Index filicum: 363 (1905), nom. nov. for *Hymenophyllum meyeri* Kuhn (1891), non C.Presl (1843). *Mecodium kuhnii* (C.Chr.) Copel.: 19 (1938). *Hymenophyllum polyanthos* (Sw.) Sw. var. *kuhnii* (C.Chr.) Schelpe: 156 (1966); Schelpe: 80 (1970); Schelpe & Diniz: 82 (1979); Jacobsen: 197 (1983); Schelpe & Anthony: 79 (1986); Burrows: 97 (1990). Type: Kilimandscharo, am Ruabach 1 900–2 300 m, *H. Meyer 310* (B, holo.).

*Trichomanes mildbraedii* Brause ex Brause & Hieron.: 376 (1915). *Hymenophyllum mildbraedii* (Brause ex Brause & Hieron.) Alston: 60 (1944). *Hymenophyllum polyanthos* (Sw.) Sw. var. *mildbraedii* (Brause ex Brause & Hieron.) Schelpe: 54 (1976); Schelpe: 66 (1977). Type: Insel Annobon, Gipfel der Santa Mina, Nebelwald, die grössere Art unförmliche Polster an Zweigen bildend, 650 m. ü. M., 10/1911, *Mildbraed 6701* (B 105317, holo.; B 105318, iso.).

**ILLUSTRATIONS:** Fig. 5C & D; Tardieu-Blot: t. 3, fig. 6, 7 (1953b).

Mostly epiphytic in moist, deeply shaded montane forests, 1 650–2 300 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Cameroon, Gabon, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Príncipe, São Tomé, Sierra Leone, South Africa, Tanzania, Uganda, Zambia and Zimbabwe.

3. ***Hymenophyllum mossambicense*** (Schelpe) Schippers in Fern Gazette 14: 187 (1993). *Hymenophyllum polyanthos* (Sw.) Sw. var. *mossambicense* Schelpe: 157 (1966); Schelpe: 80 (1970); Schelpe & Diniz: 82 (1979); Jacobsen: 197 (1983). Type: Mozambique, Gorongosa Mtn., near Gogogo Peak, locally frequent on shaded boulder in streambank forest, 5 600 ft, 06/07/1955, *Schelpe 5540* (BOLI, holo.; BM, iso.).

Epilithic, on deeply shaded boulders along streams in moist montane forests, 1 500–1 900 m.

**DISTRIBUTION:** Malawi, Mozambique and Zimbabwe.

4. ***Hymenophyllum sibthorpioides*** (Bory ex Willd.) Mett. ex Kuhn, Filices africanæ: 41 (1868); Schelpe: 79 (1970); Schelpe & Diniz: 80 (1979); Jacobsen: 191 (1983); Burrows: 94 (1990). *Trichomanes sibthorpioides* Bory ex Willd.: 498 (1810). Type: Habitat in nemoribus insulae Borboniae, *Bory de St. Vincent s.n.* (B-W 20204, holo.).

*Trichomanes parvulum* Poir.: 64 (1808). Type: l'île de Madagascar, *Aubert du Petit-Thouars s.n.* (not located).

**ILLUSTRATION:** Fig. 5E.

Epilithic or epiphytic, deeply shaded in moist forests, 1 350–1 850 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, Tanzania and Zimbabwe. Also in the Madagascan region.

**0124200 SPHAEROCIONIUM** C.Presl, Hymenophyllaceae: 33, t. 4, fig. B, t. 10, fig. B & C (1843), emend. K.Iwats. (1982). *Hymenophyllum* Sm. subgen. *Sphaerocionium* (C.Presl) C.Chr.: 5 (1934). Type: *Sphaerocionium hirsutum* (L.) C.Presl; *Trichomanes hirsutum* L.

Plants epilithic or epiphytic. *Rhizome* widely creeping, irregularly branched, with few scattered roots. *Fronds* widely spaced, uniseriate; stipe terete; lamina unistratose, pinnately compound; ultimate segments one-veined; rachis winged or not; estomate; venation anadromous, free, without false veinlets. *Indumentum* composed of simple acicular hairs occurring on the rhizome, and stalked stellate hairs occurring on the frond axes and lamina. *Sori* terminal on the veins, at the apex of the ultimate segments, involucre small, deeply 2-cleft, receptacle not extruding. *Spores* spheroidal, trilete, papillate, 32–50 µm in diameter. Chromosome number based on  $2n = 72$  or 144.

A genus of approximately 80 species occurring mainly in the neotropics. The genus is divided into two subgenera of which only subgenus *Sphaerocionium* is represented on the African subcontinent.

Subgenus **Sphaerocionium**

Subgenus *Sphaerocionium* is divided into two sections. Section *Apteropteris* (Copel.) K.Iwats. is confined to Tasmania and New Zealand.

## Section **Sphaerocionium**

### KEY TO THE SPECIES:

- 1a Rachis not winged ..... 2. ***S. capillare***  
 1b Rachis winged:  
 2a Stellate hairs occurring on all parts of the lamina ..... 3. ***S. hirsutum***  
 2b Stellate hairs confined to the axes and the lamina margin:  
 3a Lamina narrowly ovate, up to 150 mm long ..... 1. ***S. aeruginosum***  
 3b Lamina linear, up to 400 mm long ..... 4. ***S. splendidum***

1. ***Sphaerocionium aeruginosum*** (Poir.) Pic.Serm. in Webbia 23: 190 (1968a). *Trichomanes aeruginosum* Poir.: 76 (1808). *Hymenophyllum aeruginosum* (Poir.) Carm.: 513 (1818). Type: Das l'île deserte de Tristan d'Acugna, Aubert du Petit-Thouars s.n. (P, holo.).

*Hymenophyllum marlothii* Brause: 112 (1912); Sim: 76 (1915); Jacobsen: 192 (1983); Schelpe & Anthony: 77 (1986); Burrows: 98 (1990). *Sphaerocionium marlothii* (Brause) Copel.: 33 (1938). Type: Peninsula Montis Tabularis, in saxonis umbrosis humidis silvarum, Skeleton ravine, 500 m. ü. d., Marloth 5169 (B!, holo.; PRE, iso.).

*Hymenophyllum obtusum* sensu Sim: 49 (1892).

**ILLUSTRATIONS:** Fig. 4J, 5F & G; Burrows: t. 20, fig. 99, 99a (1990).

Epilithic or epiphytic, generally in permanently moist sheltered positions in montane habitats, exposed or deeply shaded, 30–900 m.

**DISTRIBUTION:** South Africa. Also on the South Atlantic islands.

2. ***Sphaerocionium capillare*** (Desv.) Copel. in Philippine Journal of Science 67: 33 (1938). *Hymenophyllum capillare* Desv.: 333 (1827); Schelpe: 80 (1970); Schelpe & Diniz: 83 (1979); Jacobsen: 195 (1983); Schelpe & Anthony: 77 (1986); Burrows: 99 (1990). Type: Pend aux arbres dans les forêts humides Ile Bourbon, J.M.C. Richard. s.n. (P, holo.).

*Hymenophyllum lineare* sensu Sim: 50 (1892); Sim: 8 (1915).

**ILLUSTRATION:** Tardieu-Blot: t. 8, fig. 3–6 (1964a).

Epilithic, deeply shaded in montane forests, 1 300–2 150 m.

**DISTRIBUTION:** Bioko, Cameroon, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Malawi, Mozambique, São Tomé, South Africa, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

3. ***Sphaerocionium hirsutum*** (L.) C.Presl, Hymenophyllaceae: 34 (1843). *Trichomanes hirsutum* L.: 1098 (1753). *Hymenophyllum hirsutum* (L.) Sw.: 99 (1801); Schelpe & Diniz: 83 (1979). Type: Based on Plumier, C., Traité des fougères de l'Amérique t. 50, fig. B (1705), icon.

**ILLUSTRATION:** Tardieu-Blot: t. 10, fig. 3 & 4 (1964b).

Epilithic or epiphytic, deeply shaded in moist montane forests, 1 400–2 200 m.

**DISTRIBUTION:** Annobon, Bioko, Cameroon, Central African Republic, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Liberia, Mozambique, São Tomé, Tanzania and Zimbabwe. Also in the Madagascan region, tropical America, Asia and New Zealand.

4. ***Sphaerocionium splendidum*** (Bosch) Copel. in Philippine Journal of Science 67: 31 (1938); Burrows: 100 (1990). *Hymenophyllum splendidum* Bosch: 192 (1863). *Hymenophyllum ciliatum* Sw. var. *splendidum* (Bosch) C.Chr.: 368 (1906). Type: Fernando Po, G. Mann s.n. (BM, holo.; L, iso.).

**ILLUSTRATION:** Burrows: t. 20, fig. 101, 101a (1990).

Epilithic or epiphytic, deeply shaded in moist montane forests, 1 400–2 200 m.

**DISTRIBUTION:** Bioko, Cameroon, Democratic Republic of the Congo, Gabon, Kenya, Malawi, Mozambique, Príncipe, São Tomé, Tanzania, Uganda and Zimbabwe.

**0124400 CREPIDOMANES** (C.Presl) C.Presl, Epimeliae botanicae: 258 (1851). *Trichomanes* L. subgen. *Crepidomanes* C.Presl: 17 (1851). Type: *Crepidomanes intramarginale* (Hook. & Grev.) C.Presl; *Trichomanes intramarginale* Hook. & Grev.

*Vandenboschia* Copel.: 51 (1938). *Trichomanes* L. subgen. *Vandenboschia* (Copel.) Allan: 34 (1961). Type: *Vandenboschia radicans* (Sw.) Copel.; *Trichomanes radicans* Sw.

Plants epilithic or epiphytic. *Rhizome* widely creeping, irregularly branched, with a few scattered roots and adhesive hairs. *Fronde* widely spaced, uniseriate; stipe terete, often distally winged; lamina unistratose, flabellate, digitate or pinnately compound; ultimate segments glabrous or setiferous when young, internal cell walls straight; rachis winged; estomate; venation anadromous, free, with or without false veinlets. *Indumentum* composed of unicellular naviculate secretory hairs along the veins and simple uniseriate acicular hairs mainly on the rhizome and along the frond axes. *Sori* terminal on the veins, solitary at the apex of the ultimate segments;

involucre cup-shaped with a bilabiate mouth; receptacle long and extruding. *Sporangia* with 16–20 indurated annulus cells. *Spores* spheroidal, trilete, papillate, 25–55 µm in diameter. Chromosome number based on  $2n = 72$  and 144.

A genus of approximately 120 species occurring mostly in the palaeotropics. Five subgenera are recognized, two of which are represented on the African subcontinent. The southern African taxa all belong to subgenus *Maiores* characterized by segments without false veinlets.

Subgenus **Maiores** (Prantl) K.Iwats. in Acta Phytotaxonomica Geobotanica 35: 174 (1984). *Trichomanes* L. subgen. *Maiores* Prantl: 52 (1875). Type: *Crepidomanes scandens* (L.) K.Iwats.: 35: 174 (1984); *Trichomanes scandens* L.: 1098 (1753).

*Gonocormus* Bosch: 321 (1861b). *Trichomanes* L. subgen. *Gonocormus* (Bosch) C.Chr.: xiv, 634 (1905). Type: *Gonocormus prolifer* Prantl.

*Vandenboschia* Copel.: 51 (1938). Type: *Vandenboschia radicans* (Sw.) Copel.; *Trichomanes radicans* Sw.

#### KEY TO THE SPECIES:

- 1a Rhizome up to 1.5 mm in diameter ..... 6. **C. radicans**
- 1b Rhizome less than 0.5 mm in diameter:
  - 2a Lamina flabellately or nearly pinnately dissected; frond axes proliferous ..... 4. **C. mannii**
  - 2b Lamina pinnately dissected; frond axes not proliferous:
    - 3a Rhizome hairs multicellular, branched:
      - 4a Indusium tubular or filiform, 2–3 times as long as wide ..... 1. **C. borbonicum**
      - 4b Indusium campanulate or obconical, 1.5 times as long as wide ..... 2. **C. frapperi**
    - 3b Rhizome hairs unicellular, unbranched:
      - 5a Stipe winged along the entire length; wings proximally with articulate hairs ..... 5. **C. melanotrichum**
      - 5b Stipe winged in the upper part only; articulate hairs absent ..... 3. **C. inopinatum**

1. **Crepidomanes borbonicum** (Bosch) J.P.Roux, comb. nov. *Trichomanes borbonicum* Bosch: 158 (1861a); Schelpe: 76 (1970); Schelpe & Diniz: 77 (1979); Jacobsen: 189 (1983); Schelpe & Anthony: 76 (1986); Burrows: 93 (1990). *Vandenboschia borbonica* (Bosch) G.Kunkel: 213 (1963). Type: Réunion, Boivin 908 (B, lecto.; P, isolecto.).

ILLUSTRATIONS: Kornaš: t. 21, fig. A–D (1994).

Epilithic or epiphytic, in moist deeply shaded habitats in montane regions, 900–1 900 m.

**DISTRIBUTION:** Bioko, Cameroon, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Rwanda, São Tomé, South Africa, Tanzania and Zimbabwe. Also in the Madagascan region.

2. **Crepidomanes frapperi** (Cordem.) J.P.Roux, comb. nov. *Trichomanes frapperi* Cordem.: 143 (1891). *Vandenboschia frapperi* (Cordem.) Pic.Serm.: 131 (1983a). Type: Ile de la Réunion, Brule de S. Denis, 1891, Bédier s.n. [P, neo., designated by Pichi Sermolli (1983a)].

*Trichomanes ramitrichum* Faden: 5–10, fig. 1–5 (1977). Type: Kenya, Kericho District, South West Man Forest, along the Kiptiget (Chepkoiis) River, ca. 16 km SSE of Kericho, 0°31'–0°30"S, 35°18'–35°19'30"E, 1 980–2 020 m, 12/06/1972, Faden & Grumbley 72/338 (EA, holo.; B, BM, BOL, BR, DSM, GH, K, LISC, LMU, MHU, MO, P, PRE, SRGH, US, WAG, Herb. PIC.SERM., iso.).

ILLUSTRATION: Kornaš: t. 23, fig. A–E (1994).

Epiphytic, in moist deeply shaded montane forests, 900–2 050 m.

**DISTRIBUTION:** Malawi, Mozambique, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region.

3. **Crepidomanes inopinatum** (Pic.Serm.) J.P.Roux, comb. nov. *Vandenboschia inopinata* Pic.Serm.: 245 (1983b). *Trichomanes inopinatum* (Pic.Serm.) J.E.Burrows: 93 (1990). Type: Zaïre, mont Shamulamba, Pichi Sermolli 4455 (Herb. PIC.SERM. 19455, holo.).

var. **inopinatum**

ILLUSTRATION: Kornaš: t. 27, fig. A–E (1994).

Epilithic or epiphytic, in moist deeply shaded montane forests, 500–1 800 m.

**DISTRIBUTION:** Burundi, South Africa, Swaziland and Zimbabwe. Also in the Madagascan region.

var. **majus** (Taton) J.P.Roux, comb. nov. [*Trichomanes pyxidiferum* L. forma *majus* Taton: 34 (1946)], is confined to eastern parts of the Democratic Republic of the Congo.

4. **Crepidomanes mannii** (Hook.) J.P.Roux, in Bothalia: 30: 155 (2000a). *Trichomanes mannii* Hook.: 75 (1867a); Schelpe: 63 (1977). *Gonocormus mannii* (Hook.) Copel. ex G.Kunkel: 212 (1963). Type: Fernando Po, G. Mann s.n. (K, holo.).

*Trichomanes musolense* Brause ex Brause & Hieron.: 377 (1915). Type: Fernando Poo, Musola oberhalb San Carlos (Westküste). Niedriger Wald zwischen Musola und dem Grasland von Moka im Südosten, 600–1 200 m. ü. M., 11/1911, Mildbraed 7057 (B 105426, holo.; B 105427, iso.).

ILLUSTRATION: Kornaš: t. 7, fig. A–F (1994).

Epilithic or epiphytic, in moist, deeply shaded montane forests, 600–2 000 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Guinea, Kenya, Liberia, Malawi, Nigeria, São Tomé, Senegal, Sierra Leone, Sudan, Tanzania, Togo, Uganda and Zambia. Also in the Madagascan region.

5. ***Crepidomanes melanotrichum*** (Schltdl.) J.P.Roux, *comb. nov.* *Trichomanes melanotrichum* Schltdl.: 56 (1832); Burrows: 92 (1990). *Vandenboschia melanotricha* (Schltdl.) Pic.Serm.: 127 (1956). *Trichomanes pyxidiferum* L. var. *melanotrichum* (Schltdl.) Schelpe: 181 (1964); Schelpe: 78 (1970); Schelpe: 63 (1977); Schelpe & Diniz: 78 (1979); Jacobsen: 188 (1983); Schelpe & Anthony: 75 (1986). Type: Prom. bon. Spei: Ad Plettenbergbay, c. 1825, *Mundt & Maire s.n.* (B, holo.; HAL 37269, P!, iso.).

*Trichomanes pyxidiferum* sensu Sim: 55 (1892); Sim: 69 (1915).

**ILLUSTRATIONS:** Fig. 4M & N, 5H & I; Kornaš: t. 25, fig. A–E (1994).

Epilithic or epiphytic, on seasonal or permanently moist, deeply shaded boulders along streams in montane forests, 250–2 150 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, São Tomé, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

6. ***Crepidomanes radicans*** (Sw.) K.Iwats. in Journal of the Faculty of Science, University of Tokyo, sect. 3, Bot. 13: 531 (1985). *Trichomanes radicans* Sw.: 97 (1801); Schelpe: 64 (1977). *Vandenboschia radicans* (Sw.) Copel.: 54 (1938). Type: Incolit arbores montium Jamaicae, *Swartz s.n.* (S, holo.).

*Trichomanes giganteum* Bory ex Willd.: 514 (1810). Type: Habitat in unica sylva ad lacum magnum insulae Borboniae in arborum truncis, *Bory de St. Vincent s.n.* (not located).

var. **radicans**

**ILLUSTRATION:** Kornaš: t. 15, fig. A–D (1994).

Epilithic or epiphytic, in deeply shaded moist evergreen forests, 1 200–1 600 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Democratic Republic of the Congo, Kenya, Nigeria, São Tomé and Tanzania. Also in Central and South America, eastern Europe and Asia.

var. **naseanum** (Christ) K.Iwats. is confined to Asia.

**01246000 TRICHOMANES** L., Species plantarum 2: 1097 (1753). Lectotype: *Trichomanes crispum* L., designated by Proctor (1977), typ. cons. (Zimmer 1999).

Plants epilithic or epiphytic. *Rhizome* widely creeping, irregularly branched, rootless or roots widely spaced. *Fronde*s widely spaced, uniseriate; stipe obsolete or distinct; lamina unistratose, irregularly divided or pinnately compound; ultimate segments one-veined, marginal hairs sometimes present; rachis obsolete or distinct and winged; estomate; venation catadromous, free, with or without false veinlets. *Indumentum* composed of simple uniseriate acicular hairs occurring on the rhizome, stipe or often the lamina margin. *Sori* terminal on the veins, involucre cup-shaped, mouth dilated or truncate, receptacle long, extruding. *Spores* spheroidal, trilete, papillate, 11–55 µm in diameter. *Gametophyte*: mature thallus filamentous, uniseriate, branched, glabrous; gametangia on short lateral branches; antheridium small, with few oblique cells; archegonia on specialised archegoniophores, neck straight, with four tiers of cells, neck canal cell binucleate; apogamy reported; vegetative reproduction by uniseriate filamentous gemmae. Chromosome number based on  $2n = 68$  and 136.

A genus of approximately 80 species occurring mostly in the neotropics. Two subgenera are recognized, but only subgenus *Didymoglossum* is present on the African subcontinent.

Subgenus **Didymoglossum** (Desv.) C.Chr., Index filicum: xiv (1905). *Didymoglossum* Desv.: 330 (1827). Type: *Trichomanes muscoides* Sw. (now *Trichomanes hymenoides* Hedw.).

Three sections are recognized, two of which occur on the African subcontinent.

#### KEY TO THE SECTIONS:

Lamina margins bearing stiff, simple hairs; false veins absent ..... 1. sect. **Didymoglossum**  
Lamina margins glabrous; false veins present ..... 2. sect. **Microgonium**

#### 1. Section **Didymoglossum**

***Trichomanes reptans*** Sw., Nova genera & species plantarum: 136 (1788); Jacobsen: 186 (1983); Schelpe & Anthony: 73 (1986); Burrows: 89 (1990). Type: Jamaica, *Swartz s.n.* (S, holo.; BM, iso.).

*Trichomanes robinsonii* Hook. ex Baker: 339, t. 8B (1867e). *Didymoglossum robinsonii* (Hook. ex Baker) Copel.: 77, t. 31, fig. 7, 8 (1938). Type: Natal, *Robinson s.n.* (K, syn.); *Sanderson s.n.* (K, syn.).

*Trichomanes montanum* sensu Sim: 71 (1915).



FIGURE 5A–M, Hymenophyllaceae. A & B, *Hymenophyllum tunbridgense*, A, pinna; B, cellular structure, Esterhuysen 14448 (NBG); C & D, *H. kuhni*, C, pinna; D, cellular structure, Roux 2856 (NBG); E, *H. sibthorpioides* lamina, Roux 2891 (NBG); F & G, *Sphaerocionium aeruginosum* pinna (stellate hairs not illustrated); G, sorus, Roux 779 (NBG); H & I, *Crepidomanes melanotrichum*, H, frond; I, hairs at the stipe base, Roux 2842 (NBG); J & K, *Trichomanes erosum* var. *aerugineum*, J, lamina; K, cellular structure, Roux 2902 (NBG); L & M, *Cephalomanes rigidum*, L, pinna segment; M, cellular structure, Roux 2888 (NBG). Scale bars: A, C, E, F, H, J, 10 mm; L, 10 mm; B, D, G, I, K, M, 1 mm.

**ILLUSTRATION:** Burrows: t. 19, fig. 88, 88a–c (1990).

Epilithic or low-level epiphytes, in deeply shaded, seasonal or permanently moist forests, 600–1 900 m.

**DISTRIBUTION:** South Africa and Tanzania. Also in the Madagascan region and South America.

2. Section **Microgonium** (*C.Presl*) *Christ*, *Die Farnkräuter der Erde*: 24 (1897). *Microgonium* *C.Presl*: 19, t. 6, fig. A, B (1843). Lectotype: *Trichomanes cuspidatum* Willd., designated by Christensen (1905).

**Trichomanes erosum** *Willd.*, *Species plantarum*, 4th edn, 5: 501 (1810); Schelpe: 76 (1970); Schelpe: 62 (1977); Schelpe & Diniz: 77 (1979); Jacobsen: 187 (1983); Burrows: 89 (1990). *Microgonium erosum* (Willd.) *C.Presl*: 27 (1847). Type: Habitat in Oware et Benin Africes, *Flugge s.n.* (B-W 20189, holo.).

*Trichomanes muscoides* sensu Sim (1892).

#### KEY TO THE VARIETIES:

Lamina entire to irregularly crenate ..... 1. var. **erosum**  
Lamina pinnatifid ..... 2. var. **aerugineum**

#### 1. var. **erosum**

**ILLUSTRATION:** Burrows: t. 19, fig. 89, 89a–c (1990).

Epilithic or epiphytic, in deeply shaded, continually moist forests, 1 000–1 600 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Pemba, Príncipe, São Tomé, Sierra Leone, Tanzania, Togo, Uganda and Zimbabwe. Also in the Madagascan region.

2. var. **aerugineum** (*Bosch*) *C.Chr. ex Bonap.*, *Notes ptéridologiques* 13: 165 (1929); Schelpe: 76 (1970); Schelpe & Diniz: 77 (1979); Jacobsen: 188 (1983); Schelpe & Anthony: 73 (1986); Burrows: 90 (1990). *Trichomanes aerugineum* *Bosch*: 201 (1863). *Microgonium aerugineum* (*Bosch.*) *Pic.Serm.*: 181 (1968a). Type: Fernando Po, *Barter s.n.* (K, holo.).

*Trichomanes pusillum* sensu Sim: 54 (1892).

*Trichomanes erosum* sensu Sim: 72 (1915).

**ILLUSTRATION:** Fig. 5J & K.

Epilithic or epiphytic, in deeply shaded, continually moist forests, 1 000–1 600 m.

**DISTRIBUTION:** Bioko, Cameroon, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Gabon, Ghana, Kenya, Liberia, Malawi, Mozambique, Nigeria, São Tomé, Sierra Leone, South Africa, Tanzania and Zimbabwe.

**0124800 CEPHALOMANES** *C.Presl*, *Hymenophyllaceae*: 17, t. 5 (1843). Type: *Cephalomanes atrovirens* *C.Presl*.

Plants terrestrial or epilithic. *Rhizome* short, decumbent to suberect, relatively thick; roots closely spaced and wiry. *Fronde*s approximate, caespitose; stipe terete, narrowly winged distally; lamina unistratose, pinnately compound; ultimate segments one-veined, lamina cells with thick internal walls; rachis narrowly winged; estomate; venation anadromous, free. *Indumentum* composed of unicellular trichomes and simple uniseriate hairs occurring along the rhizome and axes. *Sori* terminal on the veins; involucre cup-shaped, mouth truncate; receptacles long, extruding. *Spores* spheroidal, trilete, papillate, 20–60 µm in diameter. Chromosome number based on  $2n = 66$ .

A genus of approximately 60 species occurring mainly in the palaeotropics. Seven subgenera are recognized, but only subgenus *Pachychaetum* occurs on the African subcontinent.

Subgenus **Pachychaetum** *C.Presl*, *Hymenophyllaceae*: 16 (1843). Type: *Cephalomanes rigidum* (Sw.) K.Iwats.; *Trichomanes rigidum* Sw.

*Selenodesmium* (Prantl) Copel.: 80 (1938). *Trichomanes* L. sect. *Selenodesmium* Prantl: 53 (1875). Type: *Trichomanes rigidum* Sw.

**Cephalomanes rigidum** (Sw.) K.Iwats. in *Acta Phytotaxonomica Geobotanica* 35: 177 (1984). *Trichomanes rigidum* Sw.: 137 (1788); Sim: 56 (1892); Sim: 68 (1915); Schelpe: 78 (1970); Schelpe: 64 (1977); Schelpe & Diniz: 79 (1979); Jacobsen: 190 (1983); Schelpe & Anthony: 75 (1986); Burrows: 90 (1990). *Selenodesmium rigidum* (Sw.) Copel.: 81 (1938). Type: Jamaica, *sine coll. s.n.* (S, holo.; LD, UPS, iso.).

*Trichomanes cupressoides* Desv.: 330 (1827). Type: Habitat in insulis Séchelles, *sine coll. s.n.* (P, holo.).

*Trichomanes dregei* Bosch: 372 (1859). Type: Transkei, Lusikisiki, *Drège s.n.* (?P, holo.; BM, iso.).

**ILLUSTRATIONS:** Fig. 5L & M; Tardieu-Blot: t. 5, fig. 7, 8 (1953a).

Terrestrial or epilithic, in deeply shaded, continually moist boulders and earthbanks in forests, 1 200–1 900 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Príncipe, São Tomé, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region and tropical America.

11. **SCHIZAEACEAE** Kaulf., Das Wesen der Farrenkräuter: 119 (1827). Type: *Schizaea* Sm.

Plants terrestrial or epilithic. *Rhizome* siphonostelic, subterranean, short-creeping, branched; roots with passage cells in the inner sclerenchymatous cortex. *Fronds* approximate, polystichous, dimorphic; stipe not differentiated from the lamina; sterile frond lamina simple, narrowly linear, with a simple, central midrib, glabrous or sparsely set with indumentum, fertile fronds with a terminal, pectinately arranged simple or dichotomously branched segments, the margins fimbriate, abaxially densely set with indumentum; hypostomatic, in two rows on either side of the midrib, confined to the sterile parts, stomata of the diacytic type. *Indumentum* composed of unicellular and simple uniseriate, pluricellular hairs. *Sporangia* in a single row on either side of the fertile segments, sessile, almost symmetric, ovoid or ellipsoid, with a subapical, uniseriate annulus. *Spores* numerous, monolet, ellipsoidal to subglobose, foveolate, to 95 µm long. *Gametophyte*: spore germination amorphous; mature thallus subterranean or epigeous, filamentous, branched or unbranched, glabrous, mycotrophic, with special rhizoid bearing cells; antheridia on short lateral branches, large, 3- or 4-celled; archegonia in clusters on filaments or on archegoniophores, neck with 3 tiers of cells, neck canal cell binucleate. Chromosome numbers not known for any taxa in the region.

A monogeneric family with the earliest fossils has been recorded from the Quaternary (Van Konijnenberg-Van Cittert 1991).

**0126800** **SCHIZAEA** Sm. in Mémoires de l'Académie des Sciences de Turin 5: 419, t. 9, fig. 9 (1793), nom. cons. Type: *Schizaea dichotoma* (L.) Sm.; *Acrostichum dichotomum* L.

Generic description as for the family. A genus of approximately 30 species. Two subgenera are recognized in the genus, but only subgenus *Schizaea* is represented on the African subcontinent.

**KEY TO THE SUBGENERA:**

Fertile branch pinnate, its segments with narrow margins; sporangia borne in a single row on each side of a segment vein ..... 1. subgen. **Schizaea**  
 Fertile branch digitate, its segments with broad margins; sporangia borne in two or more sometimes indistinct rows on each side of a segment vein ..... 2. subgen. **Actinostachys**

1. Subgenus **Schizaea**

**KEY TO THE SPECIES:**

Rachis recurved at maturity; shortest segments at the base and apex ..... 1. **S. pectinata**  
 Rachis ascending at maturity; segments progressively smaller towards the apex ..... 2. **S. tenella**

1. **Schizaea pectinata** (L.) Sw. in Journal für die Botanik 1800, 2: 102 (1801); Sim: 230 (1892); Sim: 301 (1915); Schelpe: 52 (1970); Schelpe & Diniz: 46 (1979); Jacobsen: 173 (1983); Schelpe & Anthony: 51 (1986); Burrows: 56 (1990). *Acrostichum pectinatum* L.: 1068 (1753). Type: Drawing of a Hermann specimen from South Africa, Cape of Good Hope. Moris, Plantarum Historia universalis Oxoniensis 3: 233, S8 t. 9/30 (1699), lecto., designated by Verdcourt (2000).

**ILLUSTRATIONS:** Fig. 6A–E; Schelpe: t. 14, fig. 4 (1970).

Terrestrial, mostly in rocky places in sclerophyllous scrub (SW & S Cape) and montane grassland, exposed or partially shaded, 50–1 850 m.

**DISTRIBUTION:** Malawi, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe. Also in the Madagascan region.

2. **Schizaea tenella** Kaulf., Enumeratio filicum: 50, t. 1, fig. 7 (1824). *Microschizaea tenella* (Kaulf.) C.F.Reed: 134 (1948). Type: Promontorio bonae spei, *Chamisso* s.n. (B!, holo.; E, iso.).

**ILLUSTRATION:** Burrows: t. 13, fig. 52 (1990).

Terrestrial or epilithic, mostly along perennial montane streams, partially or deeply shaded, 200–1 200 m.

**DISTRIBUTION:** South Africa.

12. **LYGODIACEAE** C.Presl, Supplementum tentaminis pteridographiae: 98 (1845b). Type: *Lygodium* Sw.

Plants terrestrial. *Rhizome* protostelic, creeping, slender, dichotomously branched; roots with the innermost cell layer of large parenchymatous cells, the outer cortex parenchymatous, the inner cortex sclerenchymatous. *Fronds* approximate, 2-ranked, twining; stipe terete; lamina of indeterminate growth, catadromous; rachis terete to slightly flattened adaxially, pseudo-dichotomously branched; secondary rachis branches absent or present, alternate, dichotomously branched, with an arrested apical bud in each bifurcation; ultimate branches dorso-laterally narrowly ridged, pinnately compound; pinnules hemidimorphic, fertile segments with strongly reduced lamina parts serving as sporangiophores, each lateral vein bearing a sporangium and an antrorse indusium-like flange covering it abaxially; pinnules articulated at the base or not; hypostomatic, stomata of the anomocytic and/or diacytic types; venation catadromous, free, branched. *Indumentum* composed of simple uniseriate hairs confined to the frond axes and veins. Sporangium ovoid, asymmetrical, short-stalked, annulus just below the outward-pointing apex. *Spores* tetrahedral-globose, trilete, verrucate, to 120 µm long. *Gametophyte*: spore germination of the *Anemia*-type; prothallial development of the *Adiantum*-type; mature thallus epigeal, obliquely cordate, with a thick midrib, glabrous; antheridia small, mostly ventrally near the notch, with a disk-shaped basal cell, 3- or 4-celled; archegonium with up to 4 tiers of neck cells. Chromosome number: based on  $2n = 58, 116$  or  $120$ .

A monogeneric family. Fossil evidence shows that *Lygodium* already existed during the Upper Cretaceous (Brown 1943; Gandolfo et al. 2000).

**0127500 LYGODIUM** Sw. in Journal für die Botanik 1800, 2: 7, 106 (1801), nom. cons. Type: *Lygodium scandens* (L.) Sw.; *Ophioglossum scandens* L. (now *Lygodium flexuosum* (L.) Sw.; *Ophioglossum flexuosum* L.).

*Ugena* Cav.: 73 (1801). Type: *Ugena semihastata* Cav., nom. illeg.; *Lygodium semihastatum* (Cav.) Desv., nom. illeg.

Generic description as for the family. A genus of approximately 40 species with a pantropical distribution. The subgeneric classification followed here is that of Prantl (1881). Three subgenera are recognized, two of which occur on the African subcontinent.

**KEY TO THE SECTIONS:**

- 1a Secondary rachis branches bearing palmate or dichotomous ultimate segments ..... 3. sect. **Palmae**
- 1b Secondary rachis branches bear pinnate ultimate segments:
  - 2a Leaflets ovate to deltoid, lobed; lobes costate ..... 1. sect. **Lygodium**
  - 2b Leaflets oblong, lobed or elobate; lobes ecostate if present ..... 2. sect. **Volubiliae**

1. Section **Lygodium**, as '*Lygodiae*'.

No distinction could be made between *Lygodium japonicum* and *L. kerstenii*.

1. **\*Lygodium japonicum** (Thunb.) Sw. in Journal für die Botanik 1800, 2: 106 (1801). *Ophioglossum japonicum* Thunb.: 328 (1784). Type: Japan, *Thunberg s.n.* (UPS, holo.).

Terrestrial, along the edge of moist riverine forests, 50–100 m.

**DISTRIBUTION:** South Africa. Also in Asia.

2. **Lygodium kerstenii** Kuhn, Filices africanae: 28 (1868); Sim: 303 (1915); Schelpe: 57 (1970); Schelpe & Diniz: 52 (1979); Jacobsen: 181 (1983); Schelpe & Anthony: 56 (1986); Burrows: 61 (1990). Type: Insula Nossi-beh ad Madagascariam, 1864, *Kersten 75* [B!, lecto., designated by Schelpe & Anthony (1986)].

*Lygodium brycei* Baker: 138 (1901); Sim: 304 (1915). Type: Rhodesia, Mashonaland near the Portuguese boundary, drift of Renie River, alt. 2 500 ft, *J. Bryce s.n.* (K, holo.).

**ILLUSTRATIONS:** Fig. 6F–I; Schelpe: t. 16, fig. A1, 2 (1970).

Terrestrial, in permanently moist conditions along the margins of evergreen montane and riverine forests, 50–1 200 m.

**DISTRIBUTION:** Mozambique, South Africa, Swaziland, Zambia and Zimbabwe. Also in the Madagascan region.

2. Section **Volubiliae** Prantl, Untersuchungen zur Morphologie der Gefäßskryptogamen 2: 61 (1881). Type: *Lygodium volubile* Sw.

**KEY TO THE SPECIES:**

- Secondary rachis branches short; pinnules articulated ..... 1. **L. microphyllum**
- Secondary rachis branches absent; pinnules not articulated ..... 2. **L. smithianum**

1. **Lygodium microphyllum** (Cav.) R.Br., Prodromus florae Novae-Hollandiae et insulae Van-Diemen 1: 162 (1810); Schelpe: 57 (1970); Schelpe: 50 (1977); Schelpe & Diniz: 52 (1979); Jacobsen: 179 (1983); Schelpe & Anthony: 55 (1986); Burrows: 60 (1990). *Ugena microphylla* Cav.: 76, t. 595, fig. 2 (1801). Type: Luzon, Nabúa, *Née s.n.* (MA, holo.).

*Lygodium scandens* sensu Sim: 302 (1915).

**ILLUSTRATION:** Schelpe: t. 16, fig. B1–3 (1970).

Terrestrial, in permanently moist conditions along the margins of evergreen montane and riverine forests, 50–1 500 m.

**DISTRIBUTION:** Angola, Benin, Burundi, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Liberia, Malawi, Mali, Mozambique, Nigeria, Pemba, Senegal, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, Zanzibar and Zimbabwe. Also in Asia and America.

2. **Lygodium smithianum** C.Presl ex Kuhn, Filices africanae: 169 (1868); Schelpe: 51 (1977). Type: Fernando Po, *Vogel & Mann 136* (K, syn.); Ad flumen Niger, *Barter 1913* (K, syn.); Angola, Golungo Alto. Reg. 11 da, 1 000–2 400 p. alt., 05/1856, *Welwitsch 81* (K, syn.); Congo, *Smith s.n.* (BM, syn.).

**ILLUSTRATION:** Alston: t. 5, fig. A–D (1959).

Terrestrial, along the edges of moist evergreen forests, 300–800 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia and Nigeria.



13. **ANEMIAEAE** Link, Handbuch zur Erkennung der nutzbarsten und am häufigsten vorkommen den Gewächse 3: 8 (1833a). Type: *Anemia* Sw.

*Mohriaceae* (C.Presl) C.F.Reed: 168 (1948). *Schizaeaceae* subord. *Mohriaceae* C.Presl: 95 (1845b). Type: *Mohria* Sw.

Terrestrial or epilithic. *Rhizome* solenostelic or dictyostelic, short, decumbent to suberect, irregularly laterally branched, often stoloniferous, stolons siphonostelic; root cortical cells thin-walled or with the walls of the few inner layers moderately thickened, the innermost layer of few triangular cells or the outer cortex parenchymatous, inner cortex sclerenchymatous. *Fronds* approximate, caespitose, monomorphic or hemidimorphic; stipe with a single C-shaped or an open V-shaped stele with strongly incurved arms, terete or adaxially sulcate; lamina pinnately compound, anadromous and/or catadromous; pinnules sessile or short-stalked, herbaceous to coriaceous; hypostomatic or amphistomatic, stomata of the anomo-, desmo-, peri-, duploperi-, para-, polo-, copolo- and tripolocytic types; venation free, anadromous and/or catadromous. *Indumentum* composed of unicellular clavate and unicellular naviculate type trichomes occurring on the lamina, and simple uniseriate hairs (acicular in *Anemia*) with straight and/or sinuate transverse walls, the apex of which may or may not end in a thin-walled cell, and paleae that always end in a thin-walled cell, occurring on the rhizome and lamina (in *Mohria*). Sporangia borne singly at or near the vein endings, on almost unmodified distal pinnae or on two erect skeletonized basal pinnae, sessile or short-stalked, globose or subglobose, with an apical or subapical, uniseriate annulus and a well defined stomium, dehiscing by a vertical slit, exindusiate. Spores numerous, globose to tetrahedral-globose, trilete, with the ridges and grooves parallel to the equatorial plane, variously sculptured, 70–120 µm in diameter. *Gametophyte*: spore germination of the *Anemia*-type; prothallial development of the *Ceratopteris*-type; mature thallus epigeal, long-lived, thallose, chlorophyllose and mycorrhizal, with a thick central cushion and flat or spiralling wings, with 1–3-celled hairs and naviculate trichomes on the wings and cushion; gametangia interspersed, mainly along the cushion; antheridium 3-celled, the basal cell disk-shaped; archegonium with the venter embedded in the cushion, neck 4 cells in diameter, to 8 tiers of cells high, curved towards the anterior. Chromosome number based on  $2n = 76$  or 152.

The fossil history of the Anemiaceae is obscure.

#### KEY TO THE GENERA:

Sporangia borne on two basal, dimorphic and highly skeletonised pinnae ..... 0127900 **Anemia**  
Sporangia borne on almost unmodified distal pinnae ..... 0128000 **Mohria**

**0127900 ANEMIA** Sw., Synopsis filicum: 6, 155 (1806), nom. cons. Type: *Anemia phyllitidis* (L.) Sw.; *Osmunda phyllitidis* L.

Plants terrestrial or epilithic. *Rhizome* solenostelic or dictyostelic, short, decumbent to suberect. *Fronds* approximate, caespitose, hemidimorphic; stipe with a single C-shaped stele, terete or adaxially sulcate; lamina pinnately compound, anadromous and/or catadromous; pinnules short-stalked, herbaceous; hypostomatic, stomata of the desmo-, peri-, duploperi-, polo-, and copolocytic types; venation anadromous and/or catadromous, free. *Indumentum* composed of unicellular clavate and unicellular naviculate type trichomes occurring on the lamina, and simple uniseriate acicular hairs with straight transverse walls, and an apex not ending in a thin-walled cell occurring on the rhizome and frond axes. *Sporangia* borne singly at vein endings, on two erect, dimorphic, highly skeletonised basal pinnae, sessile, ovoid, with a subapical, uniseriate annulus with a well defined stomium, dehiscing by a vertical slit, exindusiate. Spores numerous, globose to tetrahedral-globose, trilete, with the ridges and grooves parallel to the equatorial plane, variously sculptured. *Gametophyte*: epigeal, elongate-cordate, more or less prostrate, with numerous rhizoids along the central cushion, wings one cell thick, with 1–4-celled marginal and superficial hairs; antheridia positioned on the cushion and adjacent parts of the wings, frequently also on the dorsal surface, with a 3-celled wall; archegonium on the ventral surface of the cushion, neck long, curved towards the anterior. Chromosome number based on  $2n = 76$  or 152.

A genus of approximately 100 species mostly occurring in the warmer parts of North and South America with a few species in Africa, Madagascar and the Indian subcontinent. Three subgenera are recognized (Mickel 1962), two of them occurring on the African subcontinent.

#### KEY TO THE SUBGENERA:

Lamina 1-pinnate; stomata pericytic; fertile and sterile pinnae approximate; spore striae broader than the ridges ..... 1. subgen. **Anemia**  
Lamina 1-pinnate-pinnatifid to 3-pinnate; stomata attached, rarely pericytic; fertile pinnae remote or approximate to the sterile pinnae; spore striae narrower than the ridges ..... 2. subgen. **Coptophyllum**

#### 1. Subgenus **Anemia**

**Anemia dregeana** Kunze in Linnaea 10: 493 (1836), as 'forma  $\alpha$ '; Sim: 231 (1892); Sim: 307 (1915); Jacobsen: 174 (1983); Schelpe & Anthony: 52 (1986); Burrows: 58 (1990). Type: In rupium faucibus nemorosis umbrosis ad Omsamwubo, *Drège s.n.* [LZt; K!, lecto., designated by Roux (1986); BM, HBG, K!, S, isolecto.].

*Anemia dregeana* Kunze forma  $\beta$  Kunze: 493 (1836). Type: Inter Omsamwubu et Omsamcaba ad catarractam magnam, *Drège s.n.* [LZt, K, lecto.! designated by Roux (1986); HBG, S, isolecto.].

**ILLUSTRATION:** Burrows: t. 13, fig. 54 (1990).

Terrestrial, in seasonally moist forests and riverine scrub, mostly partially shaded, 50–1 000 m.

**DISTRIBUTION:** South Africa and Swaziland.

2. Subgenus **Coptophyllum** (Gardner) C.Presl, Supplementum tentaminis pteridographiae: 79 (1845b). *Coptophyllum* Gardner: 133 (1842a). Type: *Anemia bruniifolia* (Gardner) T.Moore; *Coptophyllum bruniifolium* Gardner.

Section **Tomentosae** Prantl, Untersuchungen zur Morphologie der Gefäßkryptogamen 2: 87 (1881). *Hemianeimia* (Prantl) C.F.Reed subgen. *Eu-Hemianeimia* sect. *Tomentosae* (Prantl) C.F.Reed: 160 (1948). Type: *Anemia tomentosa* (Savigny) Sw.

## KEY TO THE SPECIES:

- Fertile lamina segments hairy ..... 1. **A. angolensis**  
 Fertile lamina segments glabrous ..... 2. **A. simii**

1. **Anemia angolensis** *Alston* in *Estudos, Ensaios e Documentos, Junta de Investigações Científicas do Ultramar* 12: 9, t. 2, 3, fig. A (1954); Schelpe: 54 (1970); Schelpe: 47 (1977); Schelpe & Diniz: 47 (1979); Jacobsen: 176 (1983); Burrows: 59 (1990). Type: Angola, Hulla entre rochedos, 5 600 ft, Morro de Monhino, *Welwitsch* 164 (BM, holo.; K, LISU, iso.).

*Anemia schimperiana* C.Presl var. *angustiloba* Bonap.: 133 (1915c). *Hemianeimia schimperiana* (C.Presl) Prantl var. *angustiloba* (Bonap.) C.F.Reed: 162 (1948). *Anemia simii* Tardieu var. *angustiloba* (Bonap.) Pic.Serm.: 654 (1954). Type: Afrique centrale equatoriale, rives du Lac Tanganika, sans localite plus precise, 05/05/1910, *Lechaptois s.n.* (P, holo.).

*Anemia schimperiana* sensu Carruth.: 278 (1901).

**ILLUSTRATION:** Schelpe: t. 6, fig. 1, 2 (1977).

Terrestrial or epilithic, mostly in rocky places in seasonally dry deciduous miombo woodland where the plants become dormant during the dry season, 650–1 550 m.

**DISTRIBUTION:** Angola, Democratic Republic of the Congo, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe.

2. **Anemia simii** *Tardieu* in *Notulae Systematicae* (Paris) 14: 208 (1952a), p.p.; Schelpe: 54 (1970); Schelpe & Diniz: 47 (1979); Jacobsen: 175 (1983); Schelpe & Anthony: 52 (1986); Burrows: 59 (1990). Type: Transvaal, Barberton, 04/1911, *Thorncroft* 959 (P, holo.; PRE, iso.).

*Anemia anthriscifolia* sensu Sim: 308, t. 164 (1915).

**ILLUSTRATIONS:** Fig. 6J; Schelpe: t. 15, fig. A1–3 (1970).

Terrestrial or epilithic, exposed or partially shaded in rocky habitats and undergrowth of seasonally dry miombo woodland, 500–1 500 m.

**DISTRIBUTION:** Mozambique, South Africa, Swaziland and Zimbabwe.

**0128000 MOHRIA** Sw., *Synopsis filicum*: 6, 159 (1806). Type: *Mohria thurifraga* Sw., nom. superfl. (now *Mohria caffrorum* (L.) Desv.; *Polypodium caffrorum* L.).

*Colina* Greene: 247 (1893), nom. superfl. Type: *Polypodium caffrorum* L.; *Mohria caffrorum* (L.) Desv.

Plants terrestrial or epilithic. *Rhizome* dictyostelic, short, decumbent to suberect, irregularly laterally branched, often stoloniferous, stolons siphonostelic. *Fronds* approximate, caespitose, homomorphic or hemidimorphic; stipe with a single open V-shaped stele with strongly incurved arms, terete or adaxially shallowly sulcate; lamina pinnately compound, anadromous or catadromous; pinnules sessile or short-stalked, herbaceous to coriaceous; hypostomatic or amphistomatic, stomata of the anomo-, desmo-, peri-, para-, polo-, copolo- and tripolocytic types; aerophores absent; venation free, anadromous and/or catadromous. *Indumentum* composed of unicellular clavate and unicellular naviculate type trichomes occurring on the lamina, and simple uniseriate hairs with straight and/or sinuate transverse walls, the apex may or may not end in a thin-walled cell, and paleae always ending in a thin-walled cell occurring on the rhizome and fronds. *Sporangia* borne singly near the vein endings on almost unmodified distal pinnae, short-stalked, globose, with an apical, uniseriate annulus and a well defined stomium, dehiscing by a vertical slit, exindusiate. *Spores* numerous, globose, trilete, with ridges and grooves parallel to the equatorial plane, variously sculptured, 70–120 µm in diameter. *Gametophyte*: epigeal, chlorophyllous and mycorrhizal, cushion massive and erect when mature, wings spiral, meristem lateral, with 1–3-celled hairs on the wings and cushion; antheridia mostly formed ventrally near the meristem, 3-celled; archegonium with the venter embedded in the cushion, neck 4 cells in diameter, to 8 tiers of cells high, curved towards the anterior. Chromosome number based on  $2n = 76, 152$ .

A genus of seven species confined to Africa and the Madagascan region.

## KEY TO THE SPECIES:

- 1a Pinnae adaxially sparsely to densely histute:  
 2a Lamina 1-pinnate, oblanceolate to linear-attenuate; abaxially hirsute or with few narrow to broad ovate paleae along the rachis; proximal pinnae not decurrent ..... 3. **M. marginalis**  
 2b Lamina 1-pinnate-pinnatifid to 2-pinnate, narrowly elliptic; abaxially sparsely to densely set with lanceolate to broad ovate, pale to dark brown, entire paleae; proximal pinnae widely spaced, decurrent ..... 2. **M. lepigera**  
 1b Pinnae adaxially glabrous or sparsely set with short or long hairs largely along the secondary rachises and veins:  
 3a Stipe and lamina paleae spreading; exine ridges fossulate ..... 6. **M. saxatilis**  
 3b Stipe and lamina paleae appressed or twisted but never spreading; exine ridges convex:  
 4a Fertile frond stipe significantly longer than the sterile frond stipe; adaxial surface of pinnae with hairs only; hairs with sinuate transverse walls ..... 1. **M. caffrorum**  
 4b Fertile and sterile frond stipes of near equal length; adaxial surface of the pinnae glabrous or with hairs and/or small paleae, especially along the secondary rachises; hair cells with sinuous transverse walls or ossiform:  
 5a Paleae on abaxial surface of lamina lanceolate to ovate, appressed; lamina usually <200 mm long, erect or spreading ..... 5. **M. rigida**  
 5b Paleae on abaxial surface of lamina narrowly linear to lanceolate, twisted; lamina usually >200 mm long, erect:  
 6a Lamina herbaceous; pinnae adaxially sparsely hairy, especially along the secondary rachises and veins; pinnule margins strongly dentate ..... 7. **M. vestita**

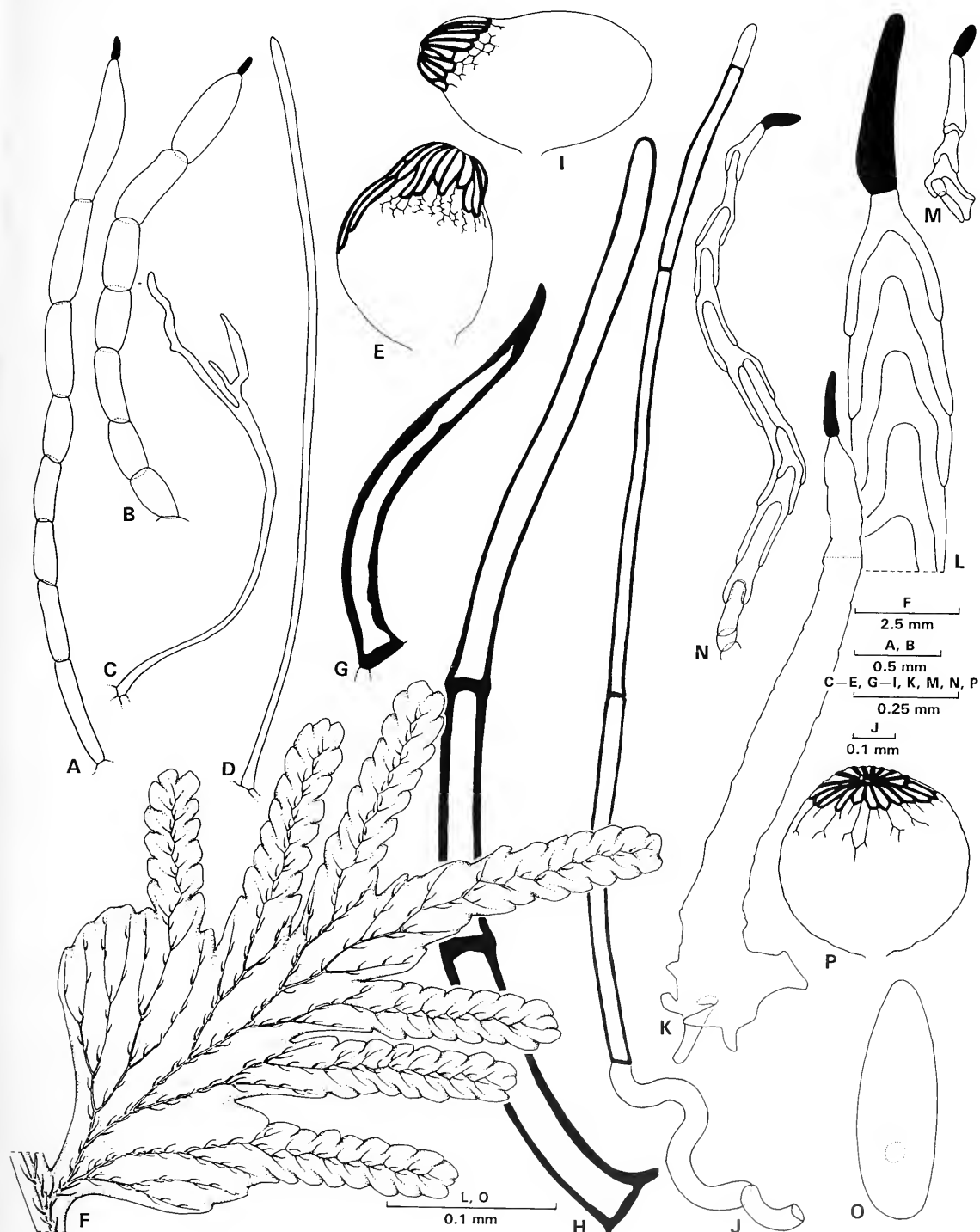


FIGURE 6A–P, Schizaeaceae, Lygodiaceae and Anemiaceae. A–E, *Schizaea pectinata*, A & B, rhizome hairs; C & D, hairs from the pinnule midrib, Van der Walt 346 (NBG); E, sporangium, Compton 22684 (NBG); F–I, *Lygodium kerstenii*, F, adaxial surface of the fertile pinnule; G, pinnule hair; H, rachis hair; I, sporangium, Burrows 1692 (NBG); J, *Anemia simii*, stipe hair, Van Jaarsveld 2031 (NBG); K–P, *Mohria caffrorum*, K, stipe palea; L, section of K showing the cellular structure; M, stipe hair; N, lamina hair; O, naviculate trichome; P, sporangium, Roux 2001 (NBG). Scale bars: F, 2.5 mm; A & B, 0.5 mm; C–E, G–I, K, M, N, P, 0.25 mm; J, O, 0.1 mm.

- 6b Lamina herbaceous to coriaceous; pinnae adaxially and abaxially glabrous or nearly so; pinnule margins shallowly dentate to crenate ..... 4. **M. nudiuscula**

1. **Mohria caffrorum** (L.) Desv. in Mémoires de la Société Linnéenne de Paris 6: 198 (1827); Sim: 233 (1892), p.p.; Sim: 304 (1915), p.p.; Jacobsen: 177 (1983), p.p.; Schelpe & Anthony: 53 (1986), p.p.; Burrows: 63 (1990), p.p. *Polypodium caffrorum* L.: 307 (1771a). *Adiantum caffrorum* (L.) L.f.: 447 (1782). *Lonchitis caffrorum* (L.) Bernh.: 124 (1801). *Colina caffrorum* (L.) Greene: 247 (1893). *Mohria thurifraga* Sw.: 159, 385 (1806), nom. superfl. Type: Habit ad Cap. b. Spei, König s.n. [LINN 1251.67!, lecto., designated by Schelpe & Anthony (1986)].

*Osmunda thurifera* Sw.: 105 (1801). Type: C.B.S., Thunberg s.n. [UPS!, lecto., designated by Schelpe & Anthony (1986)].

*Mohria thurifraga* Sw. var. *capensis* Schltdl.: 12 (1825a).

*Cheilanthes fuscata* Blume: 136 (1828). Type: Cape, erroneously given as *Crescit* in Moluccis, sine coll. s.n. (L!, holo.).

*Mohria thurifraga* Sw. var. *achilleifolia* E.J.Lowe 'as *achilliaefolia*': 104, t. 62B (1862). Type: A natural history of new and rare ferns t. 62B (icon!).

Chromosome number:  $2n = 76$  (Roux 1994a).

**ILLUSTRATION:** Fig. 6K–P.

Terrestrial or epilithic, in seasonally moist exposed or partially shaded habitats, along forest margins, and as undergrowth in sclerophyllous scrub, 50–1 400 m.

**DISTRIBUTION:** South Africa.

2. **Mohria lepigera** (Baker) Baker in Annals of Botany 5: 498 (1891); Sim: 306 (1915); Schelpe: 56 (1970); Schelpe & Diniz: 50 (1979); Jacobsen: 178 (1983); Burrows: 62 (1990). *Notholaena lepigera* Baker: 53 (1884) as '*Notochlaena*'. Type: Mount Dzomba, Zambesi-land, 6 000–7 000 ft, 09/1859, Kirk s.n. [K!, lecto., designated by Roux (1995); BM!, isolecto.].

**ILLUSTRATION:** Schelpe: t. 15, fig. C (1970).

Terrestrial or epilithic, in shallow, seasonally moist soil pockets on sheet rock and at boulder bases in montane grassland and savannah, 1 350–1 900 m.

**DISTRIBUTION:** Burundi, Democratic Republic of the Congo, Malawi, Mozambique, Rwanda, Tanzania, Zambia and Zimbabwe. Also in Madagascar.

3. **Mohria marginalis** (Savigny) J.P.Roux in South African Journal of Botany 56: 401 (1990b). *Osmunda marginalis* Savigny: 655 (1798). Type: Isle de Bourbon, Commerson s.n. [P!, lecto., designated by Roux (1990b)].

*Osmunda thurifraga* Comm. ex Savigny: 655 (1798), nom. nud.

*Osmunda thurifraga* Comm. ex Bory: 348 (1804), nom. nud.

*Osmunda crenata* Desv.: 307 (1811). Type: Habitat in insula Bourboniae, sine coll. s.n. [P!, lecto., designated by Roux (1995)].

*Mohria thurifraga* Sw. var. *borbonica* Schltdl.: 13 (1825a), nom. abort.

*Mohria hirsuta* J.P.Roux: 435 (1984); Schelpe & Anthony: 53 (1986); Burrows: 63 (1990). Type: Qwa Qwa, Tsheseng, near cave on road to The Sentinel, J.P. Roux 907 (NBG!, holo.; K!, PRE!, iso.).

Chromosome number:  $2n = 76$  (Roux 1994a).

Terrestrial or epilithic, in shallow, seasonally moist soil pockets on sheet rock and at boulder bases in montane grassland, 1 400–1 900 m.

**DISTRIBUTION:** Lesotho, Malawi, South Africa and Zambia. Also in Réunion.

4. **Mohria nudiuscula** J.P.Roux in South African Journal of Botany 56: 266 (1990a). Type: Natal, Weenen Division, damp streambanks in the MnWeni area, Drakensberg, E. Esterhuysen 14523 (NBG!, holo.; BOL!, PRE!, iso.).

*Mohria caffrorum* (L.) Desv. var. *feruginea* J.E.Burrows & S.M.Burrows: 168 (1989); Burrows: 64 (1990). Type: Natal, Underberg, Drakensberg Mountains, Injasuti, below Woman Grinding Corn, 2 000 m, 28/12/1985, J.E. & S.M. Burrows 3670 (BOL!, holo.; K, PRE!, iso.).

Chromosome number:  $2n = 152$  (Roux 1994a).

**ILLUSTRATION:** Schelpe: t. 15, fig. B1–3 (1970).

Terrestrial or epilithic, in seasonally moist montane grasslands and forest margins, exposed or lightly shaded, 800–2 100 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Lesotho, Malawi, Mozambique, South Africa, Tanzania, Zambia and Zimbabwe.

5. **Mohria rigida** J.P.Roux in South African Journal of Botany 56: 268 (1990a). Type: Qwa Qwa, at Clarens Sandstone cave on road to The Sentinel, J.P. Roux 1910 (NBG!, holo.).

Chromosome number:  $2n = 152$  (Roux 1994a).

Terrestrial or epilithic, in rocky places in montane grassveld, mostly exposed, 800–2 100 m.

**DISTRIBUTION:** Lesotho and South Africa.

6. *Mohria saxatilis* J.P.Roux in Journal of South African Botany 56: 399 (1990b). Type: Cape Province, Wuppertal, west-facing cliff near experimental forest plot on road to Heuningvlei, J.P. Roux 2012 (NBG!, holo.; K, PRE!, iso.).

Chromosome number:  $n = 76$  (Roux 1994a).

Epilithic, in seasonally moist rock crevices of the Western Cape mountains, partially shaded, 1 000–1 400 m.

**DISTRIBUTION:** South Africa.

7. *Mohria vestita* Baker in Transactions of the Linnean Society of London, Ser. 2, Botany: 328 (1887b). *Mohria caffrorum* (L.) Desv. var. *vestita* (Baker) F.Ballard : 561 (1954). Type: Tanzania, Kilimanjaro, ad rupium fissuras, 6 000 ft, Johnston s.n. (K!, holo.).

*Mohria caffrorum* sensu Schelpe: 56 (1970), p.p.; Schelpe & Diniz: 49 (1979), p.p.

Chromosome number:  $2n = 152$  (Roux 1994a).

Terrestrial or epilithic, mostly in rocky places in grassveld, 200–1 500 m.

**DISTRIBUTION:** Angola, Kenya, Lesotho, Malawi, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe. Also in Madagascar.

14. **PARKERIACEAE** Hook., Exotic flora 2: t. 147 (1825). Type: *Parkeria* Hook. (now *Ceratopteris* Brongn.).

*Pteridaceae* Rchb. tribus *Ceratopterideae* J.Sm.: 170 (1875); *Ceratopteridaceae* Underw.: 78 (1900); *Pteridaceae* Rchb. subfam. *Ceratopteridoideae* (J.Sm.) R.M.Tryon: 184 (1986a). Type: *Ceratopteris* Brongn.

Plants aquatic or semi-aquatic, rooted or free floating ephemeral plants. *Rhizome* dictyostelic, short; roots few, arising from near the stipe bases. *Fronds* caespitose, dimorphic; stipe often marginally inflated with numerous vascular bundles; lamina pinnately compound, herbaceous, glabrous, with dormant bud initials in pinna sinuses, catadromous; amphistomatic, stomata of the anomo- and polycytic types; venation reticulate, without included veinlets. *Indumentum* composed of paleae that are restricted to the rhizome. *Sporangia* borne on the ultimate segments, solitary along the veins, covered by a strongly modified marginal indusium, short-stalked, capsule globose, with 0–71 indurated annulus cells, stomium well defined. *Spores* 32 per sporangium, tetrahedral-globose, with nearly parallel ridges, granulate, 70–150  $\mu\text{m}$  in diameter. *Gametophyte*: germination of the *Vittaria*-type; prothallial development of the *Ceratopteris*-type; mature thallus dioecious, obliquely cordate, midrib thin, glabrous; antheridial thalli small, irregularly shaped, non-meristic; antheridia marginally and ventrally on wings, embedded, basal cell cup-shaped; archegonia borne ventrally on the midrib, neck curved towards the posterior, neck canal cell binucleate; apogamy reported. Chromosome number based on  $2n = 78$ .

A monogeneric family with a pantropical distribution. Edible, grown as a commercial crop in Asia and the Philippines (Copeland 1947).

**0129000 CERATOPTERIS** Brongn. in Bulletin de la Société Philomatique de Paris, Sér. 3, 8: 186 (1822); Lloyd: 148 (1974). Lectotype: *Ceratopteris thalictroides* (L.) Brongn.; *Acrostichum thalictroides* L., designated by Brongniart (1822).

*Ellobocarpus* Kaulf.: 147 (1824), nom. superfl. Type: *Ellobocarpus cornutus* Kaulf.

*Furcaria* Desv.: 292 (1827), nom. superfl. Type: *Furcaria thalictroides* (L.) Desv.; *Acrostichum thalictroides* L.

Generic description as for the family.

**Ceratopteris thalictroides** (L.) Brongn. in Bulletin de la Société Philomatique de Paris, Sér. 3, 8: 186, t. 3–4 (1822); *Acrostichum thalictroides* L.: 1070 (1753); *Pteris thalictroides* (L.) Sw.: 65 (1801); Sim: 294 (1915); Schelpe: 102 (1970); Schelpe: 82 (1977); Schelpe & Diniz: 101 (1979); Schelpe & Anthony: 95 (1986). Type: Ceylon, Herb. Hermann 3: 42, specimen 377 (BM, holo.).

*Pteris cornuta* P.Beauv.: 63, t. 37, 2 (1806). *Ceratopteris cornuta* (P.Beauv.) Lepr.: 103, t. 4A (1830); Jacobsen: 218 (1983); Burrows: 112 (1990). *Ellobocarpus cornutus* (P.Beauv.) Kaulf.: 148 (1824). *Furcaria cornuta* (P.Beauv.) Desv.: 292 (1827). *Onychium cornutum* (P.Beauv.) Hassk.: 115 (1843). *Ceratopteris thalictroides* (L.) Brongn. var. *cornuta* (P.Beauv.) Schelpe: 47 (1969b). Type: Nigeria, Oware, in salt water not far from edge of the ocean, Palisot de Beauvois s.n. (G, holo.).

**ILLUSTRATION:** Alston: t. 9, fig. A–E (1959).

Mostly free-floating or rooted aquatics, in backwaters of pools, lakes and slow-flowing streams, exposed, from near sea-level to 800 m.

**DISTRIBUTION:** Angola, Benin, Botswana, Burundi, Cameroon, Central African Republic, Chad, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mali, Mozambique, Namibia, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zanzibar and Zimbabwe. Also in the Madagascan region and widespread in Asia and Australia.

15. **PTERIDACEAE** Rchb., Handbuch des natürlichen Pflanzensystems nach allen seinen Classen: 138 (1837), as 'Pteroideae'. Type: *Pteris* L.

Plants terrestrial, epilithic or (rarely) epiphytic, ephemeral or perennial. *Rhizome* protostelic, solenostelic or dictyostelic, short or long,

suberect, decumbent or creeping, often frequently laterally branched; roots few or many, often fleshy, with or without a distinct innermost cortical layer, if present then large and parenchymatous or the inner walls densely lignified, the inner cortex mostly sclerenchymatous, the outer cortex mostly parenchymatous. *Fronds* caespitose or widely spaced, monomorphic or dimorphic; stipe vascular bundles various, V-, U-, or inverted  $\Omega$ -shaped towards the rachis, terete or adaxially shallowly sulcate, often with additional dorso-lateral grooves, sulcus open to the sulci of the lower order axes, often with stout spines; lamina pinnately compound, pedate, dichotomously forked or helicoid, often with a proliferating bud at the rachis apex, proximal pinnae often basiscopically developed, herbaceous or coriaceous, glabrous or variously set with indumentum, anadromous, isodromous or catadromous; ultimate segments often articulated; hypostomatic or amphistomatic, stomata of the hypo- anomo- and polycytic types; aerophores a continuous dorso-lateral line along the stipe, rachis and lower order axes; venation free (in sterile fronds) or reticulate, without included veinlets, ending in or near the margin, often in hydathodes, anadromous. *Indumentum* composed of unicellular glands on the abaxial surface of the lamina exuding a white or yellow farina, one- to many-celled uniseriate (rarely branched) hairs (mostly) ending in a small thin-walled (often glandular) cell, or acicular hairs occurring on the axes and lamina, and/or broadly attached (proximally often multistratose) paleae that are entire or with marginal indument of which the apex ends in a small thin-walled cell occurring on the rhizome and stipe. *Sporangia* solitary, in short lines along the veins, acrostichoid, at vein apices or along a complete or near complete near marginal vascular commissure, or on a strongly recurved indusoid margin; short-stalked, simple or trichome bearing, 3-seriate below the capsule, capsule globose, with 15–24 indurated annulus cells and a well defined stomium; exindusiate or covered by a strongly modified marginal indusium; receptacle paraphysate or not, paraphyses simple pluricellular hairs, or with the apical cell swollen and lobed. *Spores* 32 or 64 per sporangium, tetrahedral-globose, trilete, with or without a prominent equatorial flange, coarsely tuberculate, rugulate, rugate or papillate, 25–150  $\mu\text{m}$  in diameter. *Gametophyte*: spore germination of the *Vittaria*-type; prothallial development of the *Ceratopteris*-type; rarely dioecious, epigeal, the mature thallus cordate or obliquely cordate, the midrib thin or thick, with two or more equal or unequal lobes or broad uplifted wings, glabrous; rhizoids ventrally along the midrib, non-chlorophyllous; gametangia borne ventrally on the midrib or on a posterior tuberoid stalk also bearing rhizoids; antheridium 3-celled, dehiscence through a pore in the cap cell; archegonium with a neck of 4 cells 5–6 tiers of high, curving towards the anterior or the posterior, neck canal cell binucleate; often strictly apogamous. Chromosome number based on  $2n = 58, 60, 116$  or  $120$ .

*RbCL* studies (Hasebe *et al.* 1994; Hasebe *et al.* 1995) and cytological evidence based on  $n = 29$  or  $30$  (or multiples thereof) suggest that members of the Pteridaceae share a common ancestor. The group, however, is polyphyletic as the Vittariaceae, is placed as a sister group of *Adiantum*, within the Pteridaceae. The family as interpreted here, corresponds with the Pteridales of Pichi Sermolli (1958a), except for the Vittariaceae, which is treated as a family on its own.

#### KEY TO THE SUBFAMILIES:

- 1a Sporangia borne on a modified, strongly recurved margin which the veins enter ..... 3. subfam. **Adiantoidae**
- 1b Sporangia borne along the veins, at vein ends, along a marginal vascular commissure or on the lamina tissue, exindusiate or covered by a strongly modified marginal indusium which is not entered by veins:
  - 2a Sporangia grouped along the veins; indusiate or exindusiate ..... 1. subfam. **Taenitidoideae**
  - 2b Sporangia grouped at the vein ends, along a marginal vascular commissure or on the lamina tissue; exindusiate or covered by a strongly modified marginal indusium:
    - 3a Spores without a prominent equatorial flanges ..... 2. subfam. **Cheilanthoidae**
    - 3b Spores with a prominent equatorial flange, if not then the sporangia acrostichoid ..... 4. subfam. **Pteridoideae**

1. Subfamily **Taenitidoideae** (C.Presl) R.M.Tryon in American Fern Journal 76: 184 (1986a). *Taenitideae* C.Presl: 222 (1836). *Taenitidaceae* (C.Presl) Pic.Serm.: 1 (1974). Type: *Taenitis* Willd. ex Spreng.

*Actiniopteridaceae* Pic.Serm.: 5 (1962). Type: *Actiniopteris* Link.

*Adiantaceae* Newman subfam. *Gymnopteridoideae* Shieh tribus *Gymnopterideae*: 224 (1973). Type: *Gymnopteris* Bernh.

Sporangia borne along free veins or a marginal vascular commissure, the unmodified fertile segment margins serve as an indusium. Spores mostly with an equatorial flange.

#### KEY TO THE GENERA:

- 1a Lamina dichotomously forked; sporangia borne along a marginal vascular commissure ..... 0133100 **Actiniopteris**
- 1b Lamina pinnately compound; sporangia borne in soral lines at the vein apices:
  - 2a Small ephemeral plants; not bearing paraphyses among the sporangia ..... 0132200 **Anogramma**
  - 2b Medium sized perennial plants; bearing simple, uniseriate trichomes ending in a large thin-walled cell among the sporangia ..... 0131900 **Pityrogramma**

**0131900 PITYROGRAMMA** Link, Handbuch zur Erkennung der nutzbarsten und am häufigsten vorkommen den Gewächse 3: 19 (1833a). Lectotype: *Pityrogramma chrysophylla* (Sw.) Link; *Acrostichum chrysophyllum* Sw., designated by Maxon (1913a).

*Ceropteris* Link: 141 (1841), nom. superfl. Type: *Pityrogramma chrysophylla* (Sw.) Link; *Acrostichum chrysophyllum* Sw.

Plants terrestrial or epilithic. *Rhizome* dictyostelic, short, suberect. *Fronds* caespitose, monomorphic; stipe with two strap-shaped vascular bundles dorsally and two smaller ones ventrally, becoming a single V-shaped bundle towards the rachis, adaxially shallowly sulcate; lamina pinnately compound, anadromous, with a white or yellow farina abaxially; hypostomatic, stomata of the anomocytic type; aerophores not evident along the stipe, but a narrow dorso-lateral line along the lower order axes; venation free, anadromous, ending short of the margin. *Indumentum* composed of unicellular glands on the abaxial surface of the lamina, producing flavonoid aglycones, one- to many-celled uniseriate hairs ending in a large thin-walled cell among the sporangia, and sessile, entire paleae ending in a small thin-walled cell on the rhizome and stipe base. *Sporangia* borne along the veins in short soral lines, with a short 3-seriate stalk, often with uniseriate, capitate hairs, capsule globose, with 16–24 indurated annulus cells and a well defined stomium,

exindusiate. Spores trilete, tetrahedral-globose, the distal face with ridges parallel to the equatorial flange, coarsely tuberculate, 37–60 µm in diameter. *Gametophyte*: mature thallus cordate, midrib distinct, wings broad and uplifted, glabrous, rhizoids ventrally along the midrib, non-chlorophyllous; antheridia first formed, 3-celled, the basal cell funnel-shaped; archegonium neck elongated, curved towards the posterior; apogamy reported. Chromosome number based on  $2n = 60$ .

A genus of approximately 16 species, most of which occur in the neotropics.

#### KEY TO THE SPECIES:

- 1a Rhizome widely creeping; farina on the abaxial surface of the lamina orange ..... 2. ***P. aurantiaca***  
 1b Rhizome short, erect; farina on the abaxial surface of the lamina white or yellow:  
 2a Lamina oblong-lanceolate, 2-pinnate to 2-pinnate-pinnatifid ..... 3. ***P. calomelanos***  
 2b Lamina ovate-triangular, 3-pinnate to 3-pinnate-pinnatifid ..... 1. ***P. argentea***

1. ***Pityrogramma argentea*** (Willd.) Domin in Spisy Vyd-vané Přírodovedec kou Fakultou Karlovy University 88: 6 (1928); Schelpe: 105 (1970); Schelpe: 84 (1977); Schelpe & Diniz: 103 (1979); Jacobsen: 221 (1983); Schelpe & Anthony: 97 (1986); Burrows: 115 (1990). *Hemionitis argentea* Willd.: 132 (1810). *Gymnogramma argentea* (Willd.) Mett. ex Kuhn: 59 (1868); Sim: 214 (1892); Sim: 194 (1915). *Ceropteris argentea* (Willd.) Kuhn: 18 (1879). Type: Habitat in insulae Borboniae altis montibus, *Bory de St. Vincent s.n.* (B-W 19569, holo.).

*Gymnogramma thiebautii* Desv.: 215 (1827), nom. illeg.

*Gymnogramma conspersa* Kunze: 116 (1844b). *Anogramma conspersa* (Kunze) Fée: 184 (1852b). Type: Raro locis humidis umbrosis ad coronas rupium prope catarractam inter Omfondi et Tagela, 02-04/1842, *Gueinzus s.n.* (LZt, holo.; K, iso.).

ILLUSTRATION: Schelpe: t. 35, fig. 1–3 (1970).

Terrestrial or epilithic, in seasonally moist rock crevices and at boulder bases in rocky areas, 1 500–2 100 m.

DISTRIBUTION: Angola, Malawi, Mozambique, South Africa, Zambia and Zimbabwe. Also in the Madagascan region.

2. ***Pityrogramma aurantiaca*** (Hieron.) C.Chr., Index filicum, Supplementum 3: 138 (1934); Schelpe: 107 (1970). *Gymnogramma aurantiaca* Hieron.: 383, 384 (1911). Type: Deutsch-Ostafrika: oberhalb Kibosho am Kilimandscharo in 2 900 m Höhe ü. M., 24/10/1901, *Uhlir* 183 (B, syn.); Oberes Congogebiet: im Butangutal im Westen von Ruwenzori in einem Ericaceenbusch in Höhe von 3 000 bis 3 300 m ü. M., 02/1908, *Mildbraed s.n.* [B, lecto., designated by Pichi Sermolli (1972b); B, syn.].

Terrestrial, tussock forming in high altitude marshes, 2 000–2 350 m.

DISTRIBUTION: Kenya, Malawi, Rwanda, Tanzania and Uganda.

3. ***Pityrogramma calomelanos*** (L.) Link, Handbuch zur Erkennung der nutzbarsten und am häufigsten vorkommen den Gewächse 3: 20 (1833a); Schelpe: 107 (1970); Schelpe: 84 (1977). *Acrostichum calomelanos* L.: 1072 (1753). *Gymnogramma calomelanos* (L.) Kaulf.: 76 (1824). Type: Loco incerto, *sine coll. s.n.* (LINN 1245.19, holo.).

#### KEY TO THE VARIETIES:

- Farina on the abaxial surface of the lamina whitish ..... 3.1. var. ***calomelanos***  
 Farina on the abaxial surface of the lamina yellow ..... 3.2. var. ***aureoflava***

#### 3.1. var. ***calomelanos***

*Gymnogramme ochracea* sensu Sim: 213 (1892).

Terrestrial or epilithic, invasive in disturbed sites, moist conditions.

DISTRIBUTION: Angola, Bioko, Cameroon, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Liberia, Mozambique, Nigeria, Príncipe, Rwanda, São Tomé, Senegal, Sierra Leone, Tanzania and Uganda. Introduced from tropical America.

3.2. var. ***aureoflava*** (Hook.) Weath. ex L.H.Bailey, Manual of cultivated plants: 64 (1926); Schelpe: 108 (1970); Jacobsen: 222 (1983); Schelpe & Anthony: 97 (1986); Burrows: 116 (1990). *Gymnogramma calomelanos* Sw. var. *aureoflava* Hook.: t. 50 (1862b). Type: South America, Ecuador, *Seeman 948* [K, lecto., tentatively selected by Tryon (1962a)].

*Ceropteris calomelanos* sensu Sim: 196 (1915).

ILLUSTRATIONS: Fig. 7A–F; Schelpe & Anthony: t. 27, fig. 1, 1a (1986).

Terrestrial or epilithic, invasive in moist, disturbed sites, exposed or lightly shaded, 100–1 300 m.

DISTRIBUTION: South Africa and Zambia. Introduced from South America.

**0132200 ANOGRAMMA** Link, Filicum species: 137 (1841). *Pityrogramma* Link subgen. *Anogramma* (Link) Domin: 9 (1928). Lectotype: *Anogramma leptophylla* (L.) Link; *Polypodium leptophyllum* L., designated by Christensen (1905).

Plants terrestrial, ephemeral. *Rhizome* protostelic, short, erect. *Fronde* caespitose, monomorphic; stipe adaxially shallowly sulcate; lamina pinnately compound, glabrous, anadromous; hypostomatic, stomata of the anomocytic type; venation free, ending at or near the margin. *Indumentum* composed of simple uniseriate trichomes and entire paleae confined to the rhizome and the stipe base

*Sporangia* borne along the veins in short, often branched soral lines, exindusiate; receptacle nude. *Spores* tetrahedral-globose, trilete, the distal face with ridges parallel to the equatorial flange, coarsely tuberculate, 33–53 µm in diameter. *Gametophyte* epigeal, mature thallus cordate with two or more equal or unequal lobes, glabrous, a thickened midrib absent; gametangia borne on a posterior tuberoid stalk also bearing rhizoids; antheridia of the leptosporangiate type; archegonium with a neck 5–6 tiers of cells high, curving towards the anterior. Chromosome number based on  $2n = 58$  or 116.

A genus of approximately five widely distributed species.

**Anogramma leptophylla** (L.) Link, *Filicum* species: 137 (1841); Launert: 5.1 (1969); Schelpe: 99 (1970); Schelpe: 80 (1977); Jacobsen: 220 (1983); Schelpe & Anthony: 93 (1986); Burrows: 114 (1990). *Polypodium leptophyllum* L.: 1092 (1753). *Asplenium leptophyllum* (L.) Sw.: 403 (1791). *Osmunda leptophylla* (L.) Savigny: 657 (1798). *Acrostichum leptophyllum* (L.) Lam. & DC.: 565 (1805). *Grammitis leptophylla* (L.) Sw.: 23, 218, t. 1, fig. 6 (1806). *Gymnogramma leptophylla* (L.) Desv.: 305 (1811); Sim: 212 (1892); Sim: 193 (1915). *Hemionitis leptophylla* (L.) Lag.: 33 (1816). *Dicranodium leptophyllum* (L.) Newm.: 13 (1854b). *Pityrogramma leptophylla* (L.) Domin: 9 (1928). Type: Habitat in Hispania, *sine coll. s.n.* (LINN 1251.56, syn.).

**ILLUSTRATION:** Schelpe: t. 32, fig. 1–3 (1970).

Terrestrial, in seasonally moist, cool and shaded areas, 300–1 700 m.

**DISTRIBUTION:** Angola, Egypt, Kenya, Malawi, Namibia, South Africa, Tanzania, Uganda and Zimbabwe. Widespread in the Old and New World.

**0133100 ACTINIOPTERIS** Link, *Filicum* species: 79 (1841); Pic.Serm.: 6 (1962). Lectotype: *Actiniopteris radiata* (J.König ex Sw.) Link; *Asplenium radiatum* J.König ex Sw., designated by Pichi Sermolli (1962).

Plants terrestrial or epilithic. *Rhizome* dictyostelic, short, decumbent. *Fronds* caespitose, monomorphic or dimorphic; stipe shallowly sulcate adaxially; lamina dichotomously forked into numerous linear ultimate segments; hypostomatic, stomata of the hypocytic type; venation anadromous, free in sterile fronds, anastomosing in fertile fronds. *Indumentum* composed of unicellular trichomes, simple uniseriate hairs ending in an oblong thin-walled cell, and sessile paleae with a few short marginal outgrowths at the base, and an apex that ends in an oblong thin-walled cell, occurring on the rhizome and sparsely on the frond. *Sporangia* borne in a long soral line along a marginal vascular commissure connecting vein ends, long-stalked, capsule with 16–20 indurated annulus cells, covered by a continuous, modified marginal indusium; receptacle nude. *Spores* tetrahedral-globose, trilete, with a prominent equatorial flange, the proximal face tuberculate, the distal face rugate, 38–80 µm in diameter. *Gametophyte*: mature thallus obliquely cordate, midrib distinct, with broad wings that become uplifted, glabrous; rhizoids ventrally along the midrib, non-chlorophyllous; antheridia first formed, 3-celled, the basal cell funnel-shaped; archegonium with a neck curving towards the posterior, mostly non-functional, neck canal cell binucleate; strictly apogamous. Chromosome number based on  $2n = 58$ .

A genus of five species confined to Africa, Madagascar, Arabia and the Indian subcontinent.

**KEY TO THE SPECIES:**

- 1a Fronds strongly dimorphic, the fertile fronds much longer than the sterile ..... 1. **A. dimorpha**
- 1b Fronds more or less monomorphic:
  - 2a Rhizome paleae of two types: concolorous and pale brown and bicolorous, centrally darkened with pale membranous margins ..... 4. **A. semiflabellata**
  - 2b Rhizome paleae of one type: bicolorous, centrally darkened with a pale membranous margin:
    - 3a Lamina with 16–63 ultimate segments ..... 3. **A. radiata**
    - 3b Lamina with up to 16 ultimate segments ..... 2. **A. pauciloba**

1. **Actiniopteris dimorpha** Pic.Serm. in Webbia 17: 9, 18–20, t. 2, fig. a–c (1962); Schelpe: 136 (1970); Schelpe & Diniz: 140 (1979); Jacobsen: 292 (1983); Schelpe & Anthony: 149 (1986). Type: Südlichen Ostafrika (Tanganyika Terr.) Bezirk Mahenge: Sali, ca. 35 km südlich Station Mahenge, 950 m, Ubesifluss, sonnige Felswad, 21/03/1932, H.J. Schlieben 1938 (BM!, holo.).

**KEY TO THE SUBSPECIES:**

- Rhizome paleae of two types; stipe 3–4 times as long as the lamina ..... 1.1 subsp. **dimorpha**
- Rhizome paleae of one type; stipe 2–3 times as long as the lamina ..... 1.2 subsp. **diversiformis**

1.1. subsp. **dimorpha**

**ILLUSTRATION:** Pichi Sermolli: t. 2, fig. a–c (1962).

Terrestrial or epilithic, poikilohydrous, on seasonally moist rocky hillsides, at boulder bases and on cliffs in shallow soil, exposed or lightly shaded, 600–1 460 m.

**DISTRIBUTION:** Botswana, Burundi, Congo, Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Mozambique, Somalia, Sudan, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

1.2. subsp. **diversiformis** Kornaš, in Bulletin du Jardin Botanique National de Belgique 52: 282 (1982). Type: Zambia, Central Province, Kabwe Distr., Muka Mwanji Hills, near Kalwelwe, 25 km SSW of Kabwe, 14°41'S, 28°21'E, 1 220 m, Kornaš 3079 (KRA, holo.; BR, K, Herb. PIC.SERM., iso.).

**ILLUSTRATION:** Kornaš: t. 12, fig. a–c (1982).



Terrestrial or epilithic, poikilohydrous, in seasonally moist open or exposed rocky outcrops in miombo woodland, 890–1 300 m.

**DISTRIBUTION:** Zambia.

2. **Actiniopteris pauciloba** *Pic.Serm.* in Webbia 17: 21, 22, t. 3, fig. a–b (1962); Schelpe: 138 (1970); Schelpe: 112 (1977); Jacobsen: 293 (1983); Burrows: 181 (1990). Type: Angola, Pungo Andongo, 3 500 m, ad rupes gneisiacas humo parco ast diviti tectus humidiusculas Praesidii sat frequens ast unico Barrancos de Catete, 12/1856, *Welwitsch* 79 (BM, holo.; K, iso.).

**ILLUSTRATION:** Pichi Sermolli: t. 3, fig. a, b (1962).

Terrestrial or epilithic, on rocky hillsides in miombo woodland, often slightly shaded, 600–1 250 m.

**DISTRIBUTION:** Angola, Congo, Malawi, Tanzania, Zambia and Zimbabwe.

3. **Actiniopteris radiata** (*J.König ex Sw.*) *Link*, Filicum species: 80 (1841); Sim: 163 (1892); Launert: 4.1 (1969); Schelpe: 138 (1970); Schelpe: 111 (1977); Jacobsen: 291 (1983); Schelpe & Anthony: 148 (1986); Burrows: 180 (1990). *Asplenium radiatum* J.König ex Sw.: 50 (1801). *Acrostichum radiatum* J.König ex Poir.: 128 (1810). *Acropteris radiata* (J.König ex Sw.) *Link*: 56 (1833b). *Blechnum radiatum* (J.König ex Sw.) *C.Presl*: 103 (1836). *Pteris radiata* (J.König ex Sw.) *Bojer*: 399 (1837). *Actiniopteris australis* (L.f.) *Link* var. *radiata* (J.König ex Sw.) *C.Chr.*: 125 (1932b). Type: Habitat in India. D. Dris. König misit Nob. Dnus Banks, 1776 Herb. Montin [S-PA!], lecto., designated by Pichi Sermolli (1962)].

*Actiniopteris australis* sensu Sim: 250 (1915).

**ILLUSTRATIONS:** Fig. 7G & H; Pichi Sermolli: t. 1, fig. a–f (1962).

Terrestrial or epilithic, on seasonally moist rocky hillsides, at boulder bases and on cliffs in shallow soil, exposed or lightly shaded, 600–1 500 m.

**DISTRIBUTION:** Angola, Botswana, Egypt, Kenya, Malawi, Namibia, Nigeria, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, Zanzibar and Zimbabwe. Also in Macaronesia, Arabia, southern India, Sri Lanka, Afghanistan, Arabia, Yemen and Madagascar.

4. **Actiniopteris semiflabellata** *Pic.Serm.* in Webbia 17: 24, t. 4, fig. a–d (1962); Burrows: 178 (1990). Type: Ethiopia. Tertale, Pozzi di El Banno, si nota con frequenza, 02/03/1939, *Corradi* 26 (FT-Herb. PIC.SERM., holo.; FT, iso.).

**ILLUSTRATION:** Pichi Sermolli: t. 4, fig. a–d (1962).

Epilithic, in seasonally moist exposed or sheltered rock crevices, 1 200–1 500 m.

**DISTRIBUTION:** Burundi, Cameroon, Congo, Democratic Republic of the Congo, Egypt, Ethiopia, Kenya, Namibia, Rwanda, Sudan, Somalia, Tanzania, Uganda and Zanzibar. Also in Socotra, Arabia and the Madagascan region.

2. Subfamily **Cheilantheoideae** (*J.Sm.*) *W.-C.Shieh* in Journal of Science and Engineering 10: 211, 212 (1973). *Cheilantheae* J.Sm.: 277 (1875), as tribus. *Cheilantheaceae* Nayar: 233 (1970). Type: *Cheilanthes* Sw.

*Sinopteridaceae* Koidz.: 50 (1934). Type: *Sinopteris* C.Chr. & Ching.

Sori mostly marginal, along the veins, at the apex of the veins, or along a marginal vascular commissure, receptacle paraphysate or not. Spores without an equatorial flange.

#### KEY TO THE GENERA:

- 1a Sporangia borne along free, dichotomously branched veins ..... 0137700 **Coniogramme**
- 1b Sporangia borne at vein endings or along a marginal vascular commissure:
  - 2a Pinnae and/or ultimate segments articulated ..... 0136800 **Pellaea**
  - 2a Pinnae and ultimate segments never articulated:
    - 3a Lamina pedate-pinnatifid ..... 0137000 **Doryopteris**
    - 3b Lamina pinnately compound:
      - 4a Lamina abaxially with a coloured farina ..... 0136050 **Aleuritopteris**
      - 4b Lamina abaxially without a coloured farina ..... 0136000 **Cheilanthes**

**0136000 CHEILANTHES** Sw., Synopsis filicum: 5, 126 (1806), nom. cons. Type: *Cheilanthes micropteris* Sw.

*Allosorus* Bernh.: 36 (1806). Type: *Allosorus pusillus* Bernh. (now *Cheilanthes fragrans* (L.f.) Sw.; *Adiantum fragrans* L.f.).

Plants terrestrial or epilithic. *Rhizome* solenostelic or dictyostelic, short and decumbent or long and creeping, often frequently laterally branched. *Fronde* caespitose or widely spaced, monomorphic, hemimorphic or dimorphic; stipe terete or adaxially shallowly sulcate; lamina pinnately compound or pedate, anadromous or isodromous; hypostomatic, stomata of the anomocytic type; aerophores poorly developed, a continuous dorso-lateral line along the stipe, rachis and lower order axes; venation free or often with a marginal vascular commissure in the fertile fronds. *Indumentum* composed of simple uniseriate hairs often ending in a small thin-walled cell, complex branched hairs, and broadly attached or sessile paleae, mostly with entire margins, but often with stalked capitate glands along the margin, the apex mostly ending in a small thin-walled cell, variously set on the rhizome, the frond axes and lamina surfaces. *Sporangia* in sori at enlarged vein endings or in soral lines along an incomplete or complete marginal vascular commissure, stalk short or long, 3-seriate below the capsule, capsule globose, with 12–(17)–25 indurated annulus cells; indusium often a strongly modified margin; receptacle paraphysate or not, paraphyses simple uniseriate hairs. Spores trilete, tetrahedral-globose, variously sculptured, to

80 µm in diameter. *Gametophyte*: mature thallus cordate with a thick midrib, with a 3–5-celled meristematic region, glabrous; gametangia borne ventrally on the midrib, if apogamous then rarely developed; antheridia of leptosporangiate type; archegonia with a long curved neck; apogamous buds formed ventrally near the meristem. Chromosome number based on  $2n = 58$  or 60.

*Cheilanthes* Sw. is a genus of 150 to 200 species with an essentially worldwide distribution. The genus is morphologically very diverse and segregate genera are often recognized. Although numerous species groups can be identified, intermediates do occur making a subgeneric classification impracticable.

#### KEY TO THE SPECIES:

- 1a Stipe and/or rachis terete:
  - 2a Lamina abaxially densely tomentose or lanate:
    - 3a Hairs branched ..... 26. *C. rawsonii*
    - 3b Hairs simple:
      - 4a Fronds proliferous at the rachis apex ..... 17. *C. leachii*
      - 4b Fronds not proliferous:
        - 5a Tomentum along the costae and costules composed of lacerate paleae and multicellular hairs ..... 10. *C. eckloniana*
        - 5b Tomentum composed of multicellular hairs only:
          - 6a Proximal pinnae not conspicuously basiscopically developed ..... 18. *C. marlothii*
          - 6b Proximal pinnae conspicuously basiscopically developed:
            - 7a Fronds to 120 mm long; stipe and lamina densely lanate with long uniseriate hairs ..... 24. *C. perlanata*
            - 7b Fronds mostly more than 120 mm long; stipe and lamina densely lanate ..... 13. *C. inaequalis*
    - 2b Lamina abaxially glabrous, glandular, or pilose:
      - 8a Fronds strongly dimorphic (the fertile overtop the sterile) ..... 29. *C. similis*
      - 8b Fronds monomorphic:
        - 9a Lamina 1-pinnate-pinnatifid to 2-pinnate, membranous ..... 21. *C. nielsii*
        - 9b Lamina 2-pinnate-pinnatifid to 3-pinnate-pinnatifid, herbaceous:
          - 10a Rhizome widely creeping ..... 5. *C. contracta*
          - 10b Rhizome short, erect to decumbent:
            - 11a Pinnules adaxially closely set with unicellular glands, deeply lobed, the lobes oblong-obtuse to narrowly-cuneate, obtuse ..... 22. *C. parviloba*
            - 11b Pinnule segments adaxially sparsely set with multicellular hairs and rarely with a few unicellular glands; shallowly obtusely dentate ..... 12. *C. hirta*
    - 1b Stipe and/or rachis adaxially sulcate:
      - 12a Indusium discrete or absent:
        - 13a Indusium absent; lamina linear; pinnae divided into three to five pinnules ..... 7. *C. depauperata*
        - 13b Indusium present; lamina pentagonal, ovate to deltate; pinnae pinnatifid to variously pinnate:
          - 14a Lamina adaxially variously pilose ..... 2. *C. bergiana*
          - 14b Lamina adaxially glabrous or with a few small paleae but never pilose:
            - 15a Rachis and secondary rachises narrowly winged, often only in the upper half:
              - 16a Lower pinnae reduced ..... 16. *C. kunzei*
              - 16b Lower pinnae not reduced:
                - 17a Ultimate segments cultrate, dentate-serrate ..... 28. *C. schimperii*
                - 17b Ultimate segments rotund to oblong-deltate ..... 4. *C. capensis*
            - 15b Rachis and secondary rachises not winged:
              - 18a Basal pinnae not conspicuously basiscopically developed:
                - 19a Lamina narrowly ovate-deltate, the basal pinnae largest; pinnules narrowly deltate to hastate ..... 8. *C. dinteri*
                - 19b Lamina narrowly elliptic, the basal pinnae slightly reduced; pinnules narrowly oblong ..... 1. *C. angustifrons*
              - 18b Basal pinnae conspicuously basiscopically developed:
                - 20a Veins on adaxial surface apparent ..... 23. *C. pentagona*
                - 20b Veins on adaxial surface obscure ..... 19. *C. multifida*
        - 12b Indusium continuous:
          - 21a Lamina outline pentagonal, the basal pinnae nearly as long or longer than the lamina and conspicuously basiscopically developed:
            - 22a Lamina 1-pinnate to 3-pinnate; sori not paraphysate ..... 30. *C. viridis*
            - 22b Lamina mostly 4-pinnate; sori paraphysate ..... 25. *C. quadripinnata*
          - 21b Lamina outline linear, lanceolate, ovate or deltate, the basal pinnae much shorter than the lamina:
            - 23a Lamina abaxially densely set with narrow paleae and hairs ..... 14. *C. induta*
            - 23b Lamina abaxially glabrous or nearly so:
              - 24a Lamina linear ..... 11. *C. hastata*
              - 24b Lamina lanceolate, ovate or deltate:
                - 25a Lamina mostly less than 100 mm long:
                  - 26a Rachis winged by the lamina:
                    - 27a Stipe sulcus square; under surfaces of secondary rachises green ..... 27. *C. robusta*
                    - 27b Stipe sulcus rounded; under surface of secondary rachises castaneous ..... 6. *C. deltoidea*
                  - 26b Rachis not winged by the lamina:
                    - 28a Rachis and secondary rachises abaxially densely paleate ..... 9. *C. dolomitica*
                    - 28b Rachis and secondary rachises glabrous or with few small paleae:
                      - 29a Basal pinnae largest; ultimate segments oblong to somewhat hastate ..... 20. *C. namaquensis*
                      - 29b Basal pinnae reduced; ultimate segments deltoid or oblong-obtuse ..... 16. *C. kunzei*
                - 25b Lamina mostly more than 100 mm long:
                  - 30a Basal pinnae not conspicuously basiscopically developed ..... 8. *C. dinteri*
                  - 30b Basal pinnae conspicuously basiscopically developed:

- 31a Stipe moderately paleated at maturity:  
 32a Stipe brown ..... 3. **C. botswanae**  
 32b Stipe atrocastaneous ..... 15. **C. involuta**  
 31b Stipe glabrous or sparsely paleated at maturity:  
 33a Lamina 1-pinnate to 3-pinnate; sori non-paraphysate ..... 30. **C. viridis**  
 33b Lamina usually 4-pinnate; sori with uniseriate simple paraphyses ..... 25. **C. quadripinnata**

1. **Cheilanthes angustifrondosa** *Alston* in *Bulletin of the British Museum (Natural History)*, Botany 1: 48, t. 2 (1952); Schelpe: 123 (1970); Schelpe: 102 (1977). Type: Angola, District of Moxico, towards the top of a hill, south of Lusavo Falls, in *Brachystegia-Isobertinia* woodland on sand near rocky outcrop, *Milne-Redhead 4074* (K, holo.; BM, iso.).

ILLUSTRATION: Schelpe: t. 18, fig. 1, 2 (1977).

Terrestrial or epilithic, among rocks in miombo woodland, 1 000–1 500 m.

DISTRIBUTION: Angola, Democratic Republic of the Congo, Mozambique, Tanzania and Zambia.

2. **Cheilanthes bergiana** *Schldtl.*, *Adumbratio plantarum*: 51 (1832); Schelpe: 124 (1970); Schelpe & Diniz: 126 (1979); Jacobsen: 267 (1983); Schelpe & Anthony: 139 (1986); Burrows: 150 (1990). *Hypolepis bergiana* (Schldtl.) Hook.: 67 (1852); Sim: 78 (1892); Sim: 238 (1915). Type: In Promontorio bonae spei, *Bergius s.n.* (B!, holo.).

ILLUSTRATION: Burrows: t. 36, fig. 152, 152a (1990).

Terrestrial, in deep shade in moist evergreen forests and along forest margins, 20–1 500 m.

DISTRIBUTION: Kenya, Malawi, Mozambique, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe. Also in Madagascar.

3. **Cheilanthes botswanae** *Schelpe & N.C. Anthony* in *Contributions from the Bolus Herbarium* 10: 151, 152 (1982); Schelpe & Anthony: 127 (1986); Burrows: 148 (1990). Type: Botswana, Ootse Hills, 25 miles SE of Gaborone, SE Botswana, 4 000 ft, 30/06/1974, *Mott 292* (BOL!, holo.; GH, K, PRE, SRGH!, UBLS, iso.).

ILLUSTRATION: Burrows: t. 34, fig. 150, 150a (1990).

Terrestrial or epilithic, in seasonally moist rocky areas, exposed or partially shaded, 1 000–1 350 m.

DISTRIBUTION: Botswana and South Africa.

4. **Cheilanthes capensis** (*Thunb.*) *Sw.*, *Synopsis filicum*: 128 (1806); Sim: 81 (1892); Launert: 7.2 (1969); Jacobsen: 251 (1983); Schelpe & Anthony: 124 (1986); Burrows: 142 (1990). *Adiantum capense* Thunb.: 173 (1800). *Adiantopsis capensis* (Thunb.) Fée: 145 (1852b); Sim: 218 (1915). *Hypolepis capensis* (Thunb.) Hook.: 71, t. 77C (1852). Type: e Cap. b. Spei, *Thunberg s.n.* (UPS-THUNB 25072!, holo.; LD, iso.).

*Cheilanthes praetexta* Kaulf.: 212, 213 (1824). Type: Habitat in Promont. b. spei, *sine coll. s.n.* (?LE, holo.; E, iso.).

ILLUSTRATION: Burrows: t. 33, fig. 143, 143a (1990).

Terrestrial or epilithic, in seasonally moist sheltered rock crevices and in low scrub, mostly shaded, 50–1 500 m.

DISTRIBUTION: Lesotho, Namibia and South Africa.

Anthony (1984) reported putative hybrids between this species and *Cheilanthes hastata*.

5. **Cheilanthes contracta** (*Kunze*) *Mett. ex Kuhn*, *Filices africanae*: 70 (1868); Schelpe & Anthony: 119 (1986); Burrows: 135 (1990). *Cheilanthes hirta* Sw. var. *contracta* Kunze: 539 (1836); Sim: 85 (1892); Sim: 229 (1915); Jacobsen: 262 (1983). *Myriopteris contracta* (Kunze) Fée: 149 (1852b). Type: Ad kopje secus Zwartkoprivier, 500 p., *Drège s.n.* [BM!, lecto., designated by Anthony (1984); K, L, SI, SAM!, islecto.].

ILLUSTRATIONS: Fig. 7I & J; Burrows: t. 30, fig. 136, 136a (1990).

Terrestrial or epilithic, mostly in seasonally moist rock crevices and at boulder bases, exposed or partially shaded, 50–1 500 m.

DISTRIBUTION: South Africa.

6. **Cheilanthes deltoidea** *Kunze* in *Linnaea* 10: 535, 536 (1836); Schelpe & Anthony: 125 (1986); Burrows: 143 (1990). *Pellaea deltoidea* (Kunze) Baker: 146 (1867b); Sim: 94 (1892); Sim: 216 (1915); Launert: 7.7 (1969). *Allosorus deltoideus* (Kunze) Kuntze: 806 (1891). *Doryopteris deltoidea* (Kunze) Diels: 269 (1899); Sim: 216 (1915). Type: In rupium fissuris ad Zilverfontein, *Drège s.n.* [LZ†; K!, lecto., designated by Anthony (1984); B!, BM!, K, islecto.].

*Doryopteris deltoidea* (Kunze) Diels var. *laxa* Sim: 217, t. 105, fig. 2 (1915). Type: Cape Province, Namaqualand, between O'Okiep and NababEEP, *Bolus 9463* (PRE, holo.; BOL, K, iso.).

ILLUSTRATION: Schelpe & Anthony: t. 38, fig. 2 (1986).

Terrestrial or epilithic, in sheltered or exposed crevices on rock outcrops, dormant during the dry season, 140–1 300 m.

DISTRIBUTION: Namibia and South Africa.

7. **Cheilanthes depauperata** Baker in Annals of Botany 5: 210 (1891); Sim: 82 (1892); Sim: 226 (1915); Jacobsen: 249 (1983); Schelpe & Anthony: 119 (1986); Burrows: 139 (1990). Type: Cape Province, borders of the Karroo, *Barkly s.n.* (K!, holo.; BOL!, SAM!, iso.).

**ILLUSTRATION:** Burrows: t. 35, fig. 140, 140a (1990).

Terrestrial, in exposed rock crevices or partially shaded at boulder bases, seasonally moist, 450–1 300 m.

**DISTRIBUTION:** South Africa.

Anthony (1984) reported a putative hybrid between this species and *Cheilanthes contracta*.

8. **Cheilanthes dinteri** Brause in Botanische Jahrbücher für Systematik 53: 385–387 (1915); Launert: 7.2 (1969); Schelpe: 102 (1977); Jacobsen: 266 (1983); Schelpe & Anthony: 139 (1986); Burrows: 154 (1990). Type: Deutsch-Südwest-Afrika: Okahandja, 1 250 m ü. M., 18/01/1907, *Dinter 392* [B!, lecto., designated by Anthony (1984); BM!, GRA, P!, PRE, S, SAM!, iso.].

**ILLUSTRATION:** Burrows: t. 36, fig. 155, 155a (1990).

Epilithic, exposed or partially shaded in crevices of rock outcrops, 1 200–1 800 m.

**DISTRIBUTION:** Angola and Namibia.

9. **Cheilanthes dolomiticola** (Schelpe) Schelpe & N.C. Anthony in Contributions from the Bolus Herbarium 10: 155 (1982); Schelpe & Anthony: 127 (1986); Burrows: 144 (1990). *Pellaea dolomiticola* Schelpe: 239 (1968); Jacobsen: 283 (1983). Type: Cape Province, Vryburg division, limestone crevices, 4 100 ft, Tiger Kloof, 02/04/1956, *Schelpe 5885* (BOL!, holo.; B, BM!, C, GH, K, M, MO, NBG!, NU, P, PR, PRE, S, iso.).

**ILLUSTRATION:** Burrows: t. 33, fig. 147, 147a (1990).

Epilithic, in crevices of dolomitic rock outcrops, exposed or lightly shaded, 700–1 900 m.

**DISTRIBUTION:** South Africa.

10. **Cheilanthes eckloniana** (Kunze) Mett. in Abhandlungen herausgegeben von der Senckenbergischen Naturforschenden Gesellschaft 3: 66 (1859a); Schelpe: 125 (1970); Jacobsen: 256 (1983); Schelpe & Anthony: 115 (1986); Burrows: 130 (1990). *Notholaena eckloniana* Kunze: 501 (1836); Sim: 208 (1892); Sim: 222 (1915); Launert: 7.4 (1969). Type: Sneeubergen, locis rupestribus, 4 000–5 000 p., 1838, *Drège s.n.* [LZ!, BM!, lecto., designated by Schelpe (1969b); G!, L, isolecto.].

*Notholaena krebsiana* C.Presl: 224 (1836), nom. nud. Type: Based on Krebs, Pl. cap. exs. 372.

Apogamous.

**ILLUSTRATION:** Schelpe: t. 35, fig. 1, 1a (1986).

Terrestrial or epilithic, often in shallow soils on sheetrock, at boulder bases and in montane grasslands, exposed or lightly shaded, 700–2 000 m.

**DISTRIBUTION:** Lesotho, Namibia, South Africa, Swaziland and Zimbabwe.

11. **Cheilanthes hastata** (L.f.) Kunze in Linnaea 10: 582 (1836); Schelpe & Anthony: 123 (1986); Burrows: 140 (1990). *Adiantum hastatum* L.f.: 447 (1782). *Pteris hastata* (L.f.) Sw.: 69, 70 (1801), non Thunb. (1800). *Allosorus hastatus* (L.f.) C.Presl: 153 (1836). *Cassebeera hastata* (L.f.) J.Sm.: 159 (1841b). *Pellaea hastata* (L.f.) Link: 60 (1841); Jacobsen: 282 (1983). *Platyloma hastata* (L.f.) Lowe: 3 (1857). Type: Cap. b. Spei, *sine coll. s.n.* (LINN 1252.4!, holo.).

*Pteris auriculata* Thunb.: 172 (1800). *Cheilanthes auriculata* (Thunb.) Link: 36 (1833b); Sim: 91 (1892). *Allosorus auriculatus* (Thunb.) C.Presl: 153 (1836). *Cassebeera auriculata* (Thunb.) J.Sm.: 20 (1846). *Pellaea auriculata* (Thunb.) Fée: 129 (1852b); Sim: 199 (1915). Type: Promontorio bonae Spei, *Thunberg s.n.* (UPS, holo.).

*Adiantum auriculatum* Thunb.: 173 (1800). *Pteris auriculata* (Thunb.) Sw.: 69 (1801), non Thunb. (1800). Type: Promontorio bonae Spei, *Thunberg s.n.* (UPS, holo.).

*Pteris varia* Sw.: 69 (1801). Type: Cape of Good Hope, *sine coll. s.n.* (not located).

*Pellaea lancifolia* Baker: 199 (1874b); Sim: 96 (1892); Sim: 201 (1915). *Allosorus lancifolius* (Baker) Kuntze: 806 (1891). Type: Cape Province, Namaqualand, *Barkly s.n.* (K, holo.; GRA, SAM!, iso.).

*Pellaea hastata* (L.f.) Link var. *reticulata* Schelpe: 133 (1969a). Type: 5 miles N of Sutherland, *Schelpe 4948* (BOL!, holo.).

**ILLUSTRATION:** Schelpe & Anthony: t. 38, fig. 4 (1986).

Terrestrial or epilithic, deciduous, cool, seasonally moist, mostly shaded rock crevices and earthbanks, 30–1 700 m.

**DISTRIBUTION:** Namibia and South Africa.

12. **Cheilanthes hirta** Sw., Synopsis filicum: 128 (1806); Sim: 83 (1892); Sim: 227 (1915); Launert: 7.2 (1969); Schelpe: 124 (1970); Schelpe: 102 (1977); Schelpe & Diniz: 127 (1979); Jacobsen: 261 (1983); Schelpe & Anthony: 121 (1986); Burrows: 135 (1990). *Adiantum hirtum* (Sw.) Poir.: 142 (1810). *Notholaena hirta* (Sw.) J.Sm.: 50 (1841b). *Myriopteris hirta* (Sw.) J.Sm.: 174 (1866). Type: Ex

insula Mauritii, *Gröndal s.n.* (S-PA!, holo.).

*Adiantum caffrorum* Sw.: 85 (1801), non L.f. (1782). Type: ex insula Mauritii, *Gröndal s.n.* (S-PA!, holo.).

*Notholaena capensis* Spreng.: 32 (1828). Type: Cape Province, Uitenhage, *Zeyher 275* (LZ†; B? iso.).

*Cheilanthes hirta* Sw. var. *intermedia* Kunze: 539 (1836). *Myriopteris intermedia* (Kunze) Fée: 149 (1852b). Type: In montib. Witbergen, *Drège s.n.* [LZ†; B, lecto., designated by Anthony (1984); SAM!, isolecto.].

*Cheilanthes hirta* Sw. var. *laxa* Kunze: 540 (1836). *Cheilanthes hirta* Sw. forma *laxa* (Kunze) Alston: 20 (1954). *Cheilanthes hirta* Sw. var. *brevipilosa* W.Jacobsen & N.Jacobsen forma *laxa* (Kunze) W.Jacobsen & N.Jacobsen: 65 (1988). Type: Prope Bokpoort in Nieuweveld, *Drège s.n.* [LZ†; B, lecto., designated by Anthony (1984); L, SAM!, isolecto.].

*Cheilanthes glandulosa* Pappe & Raws.: 35 (1858), non Sw. (1817). Type: Griqualand, *Moffatt s.n.* (not located).

*Cheilanthes hyaloglandulosa* W.Jacobsen & N.Jacobsen: 145–148 (1985); Burrows: 138 (1990). Type: Transvaal, farm Wanhoop 78JT, 2 250 m, *Jacobsen 5255* (PRE, holo.).

*Cheilanthes hirta* Sw. var. *brevipilosa* W.Jacobsen & N.Jacobsen: 64 (1988); Burrows: 136 (1990). Type: Transvaal, Mondeor, Johannesburg, *Jacobsen 5254* (PRE, holo.).

*Cheilanthes hirta* Sw. var. *brevipilosa* W.Jacobsen & N.Jacobsen forma *waterbergensis* W.Jacobsen & N.Jacobsen: 68 (1988); Burrows: 138 (1990). Type: North-western Transvaal, farm Ketting 368LR, *Jacobsen 5121* (PRE, holo.).

*Cheilanthes hirta* Sw. var. *numerosa* W.Jacobsen & N.Jacobsen: 69 (1988); Burrows: 138 (1990). Type: Eastern Transvaal, Mount Sheba Nature Reserve, *Jacobsen 4443* (PRE, holo.).

*Cheilanthes hirta* Sw. var. *infracampestris* W.Jacobsen & N.Jacobsen: 71 (1988); Burrows: 138 (1990). Type: Transvaal, Kruger National Park, *Van der Schijff 3990* (PRE, holo.).

Sexual or apogamous.

**ILLUSTRATIONS:** Fig. 7M; Burrows: t. 32, fig. 137, 137a–n (1990).

Terrestrial or epilithic, in seasonally moist rock crevices and at boulder bases, exposed or partially shaded, 250–2 600 m.

**DISTRIBUTION:** Angola, Botswana, Kenya, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

13. ***Cheilanthes inaequalis*** (Kunze) Mett. in *Abhandlungen herausgegeben von der Senckenbergischen Naturforschenden Gesellschaft* 3: 68, t. 3, fig. 4 (1859a). *Notholaena inaequalis* Kunze: 146, t. 64, fig. 1 (1844a); Sim: 206 (1892); Sim: 221 (1915); Launert: 7.4 (1969); Schelpe: 126 (1970); Schelpe: 103 (1977); Schelpe & Diniz: 129 (1979); Jacobsen: 257 (1983). Type: Transvaal, Macalisberg, *Burke s.n.* (LZ†; BM!, K!, iso.).

*Notholaena inaequalis* Kunze var. *angolensis* Fritsch: 1090 (1901). Type: Huila, *Newton 15* (W, holo.).

#### KEY TO THE VARIETIES:

Lamina adaxially densely tomentose ..... 13.1. var. **inaequalis**  
Lamina adaxially pilose ..... 13.2. var. **buchananii**

13.1. var. **inaequalis**, Schelpe & Anthony: 116 (1986); Burrows: 129 (1990).

*Notholaena bipinnata* (Sim) Sim: 224 (1915), p.p. excl. t. 109, fig. 2, non Liebm. (1849). Type: Bulawayo, *Eyles & Johnson 1020* (GRA!, lecto., here designated).

Apogamous.

**ILLUSTRATION:** Burrows: t. 30, fig. 130, 130a (1990).

Terrestrial or epilithic, in shallow soils and in rock crevices on rocky outcrops and in montane grassland, seasonally moist, 1 200–2 350 m.

**DISTRIBUTION:** Angola, Burundi, Cameroon, Democratic Republic of the Congo, Guinea, Kenya, Malawi, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in Madagascar.

13.2. var. **buchananii** (Baker) Schelpe in *Boletim da Sociedade Broteriana*, Sér. 2, 41: 211 (1967); Schelpe: 126 (1970); Schelpe & Diniz: 129 (1979); Schelpe & Anthony: 116 (1986); Burrows: 129 (1990). *Notholaena buchananii* Baker: 373 (1868a); Sim: 207 (1892); Sim: 222 (1915). Type: Natal, *Buchanan & McKen 32* [K!, lecto., designated by Schelpe (1969b); BM!, isolecto.].

**ILLUSTRATION:** Burrows: t. 30, fig. 130b, c (1990).

Terrestrial or epilithic, in seasonally moist, sheltered and shaded sites in rocky areas, 250–1 200 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Malawi, Mozambique, South Africa, Zambia and Zimbabwe.

14. *Cheilanthes induta* Kunze in Linnaea 10: 538 (1836); Sim: 88 (1892); Sim: 232 (1915); Jacobsen: 263 (1983); Schelpe & Anthony: 117 (1986); Burrows: 132 (1990). *Myriopteris induta* (Kunze) Fée: 149 (1852b). Type: Locis rupestribus umbrosis in montibus Sneeuwbergen, Drège s.n. [LZ†; B 399, lecto., designated by Anthony (1984)].

**ILLUSTRATION:** Burrows: t. 31, fig. 134, 134a (1990).

Terrestrial or epilithic, mostly in sheltered shaded situations in rocky areas and in sclerophyllous scrub, 700–2 000 m.

**DISTRIBUTION:** South Africa.

15. *Cheilanthes involuta* (Sw.) Schelpe & N.C. Anthony in Contributions from the Bolus Herbarium 10: 155 (1982). *Pteris involuta* Sw.: 69 (1801). *Allosorus involutus* (Sw.) C. Presl: 153 (1836). *Pellaea involuta* (Sw.) Baker: 148 (1874a); Sim: 100 (1892); Sim: 205 (1915); Launert: 7.7 (1969). *Pteridella involuta* (Sw.) Mett. ex Kuhn: 15 (1879). *Pellaea viridis* (Forssk.) Prantl var. *involuta* (Sw.) Schelpe: 214 (1967); Schelpe: 136 (1970); Schelpe & Diniz: 130 (1979); Jacobsen: 287 (1983). Type: Cape Province, *sine coll.* s.n. (UPS-THUNB!, holo.).

*Cheilanthes cornuta* Kunze, 10: 534 (1836). Type: Klein-Vischrivier in rupestribus secus fluvium, 100 m, Drège s.n. [LZ†; BM!, lecto., designated by Roux (1986); HBG, L, isolecto.].

#### KEY TO THE VARIETIES:

Lamina linear to lanceolate; sulci of stipe and rachises rounded ..... 15.1. var. **involuta**  
Lamina subdeltate; sulci of stipe and rachises flat to square ..... 15.2. var. **obscura**

15.1. var. **involuta**, Schelpe & Anthony: 128 (1986); Burrows: 145 (1990).

**ILLUSTRATION:** Fig. 7N.

Terrestrial or epilithic, on rocky and shrubby slopes, exposed or partially shaded, 300–1 850 m.

**DISTRIBUTION:** Angola, Burundi, Kenya, Rwanda, South Africa, Tanzania and Uganda.

15.2. var. **obscura** (N.C. Anthony) N.C. Anthony in Contributions from the Bolus Herbarium 11: 136 (1984); Schelpe & Anthony: 129 (1986); Burrows: 145 (1990). *Cheilanthes viridis* (Forssk.) Sw. var. *obscura* N.C. Anthony: 154 (1982), p.p. Type: Basutoland, Maseru, Devils Mountain, 8 800 ft, 17/07/1955, *Bowmaker* 59 (BOL!, holo.).

Apogamous.

**ILLUSTRATION:** Burrows: t. 34, fig. 148c–e (1990).

Terrestrial or epilithic, mostly at boulder bases, partially shaded, 400–2 950 m.

**DISTRIBUTION:** Botswana, Lesotho, Mozambique, Namibia, South Africa, Zambia and Zimbabwe.

16. *Cheilanthes kunzei* Mett. in Abhandlungen herausgegeben von der Senckenbergischen Naturforschenden Gesellschaft 5: 71, n. 22, t. 3, fig. 6, 7 (1859a); Schelpe & Anthony: 124 (1986); Burrows: 143 (1990). *Cheilosoria kunzei* (Mett.) Trevis.: 580 (1877). Type: Ad rupes Zilverfontein, Drège s.n. [LZ†; B 386!, lecto., designated by Anthony (1984)].

*Cheilanthes profusa* Kunze ex Link var. *minor* Kunze: 535 (1836). *Pellaea hastata* (L.f.) Link var. *minor* (Kunze) Schelpe: 133 (1969a). Type: As for *Cheilanthes kunzei* Mett.

**ILLUSTRATION:** Schelpe & Anthony: t. 38, fig. 1 (1986).

Terrestrial or epilithic, in seasonally moist conditions in rock crevices and at boulder bases, exposed or partially shaded, 600–1 000 m.

**DISTRIBUTION:** Namibia and South Africa.

17. *Cheilanthes leachii* (Schelpe) Schelpe in Boletim da Sociedade Broteriana, Sér. 2, 41: 212 (1967); Schelpe: 125 (1970); Schelpe & Diniz: 127 (1979); Jacobsen: 254 (1983); Burrows: 129 (1990). *Notholaena leachii* Schelpe: 185 (1964). Type: Moçambique, Moçambique district, Ribauê, 1½ miles. SW of Poste Agrícola; locally common around boulder bases on S. aspect of granite hill, 1 800 ft, 21/07/1962, *Schelpe & Leach* 6973 (BOL!, holo.; K, SRGH!, iso.).

**ILLUSTRATION:** Burrows: t. 30, fig. 131, 131a (1990).

Terrestrial or epilithic, in constantly or seasonally moist conditions, in rock crevices and at boulder bases, 900–1 850 m.

**DISTRIBUTION:** Malawi, Mozambique, Tanzania, Zambia and Zimbabwe.

18. *Cheilanthes marlothii* (Hieron.) Schelpe in Contributions from the Bolus Herbarium 1: 74 (1969b); Schelpe: 103 (1977); Jacobsen: 259 (1983); Schelpe & Anthony: 113 (1986); Burrows: 132 (1990). *Notholaena marlothii* Hieron.: 384 (1911); Launert: 7.5 (1969). Type: Deutsch-Südwest-Afrika: an der halbschattigen Glimmerschieferbergseite bei Okahandja, 1 200 m ü. M., *Dinter* 386 [B!, lecto., designated by Schelpe (1969b); BR, GRA, SAM!, isolecto.].

**ILLUSTRATION:** Schelpe & Anthony: t. 35, fig. 2, 2a (1986).

Epilithic, on seasonally dry rock outcrops, exposed, 1 000–2 480 m.

**DISTRIBUTION:** Angola, Namibia and South Africa.

19. *Cheilanthes multifida* (Sw.) Sw., Synopsis filicum: 129, 334 (1806); Sim: 87 (1892); Sim: 231 (1915); Launert: 7.3 (1969); Schelpe: 123 (1970); Schelpe: 100 (1977); Schelpe & Diniz: 125 (1979); Jacobsen: 264 (1983); Schelpe & Anthony: 135 (1986); Burrows: 150 (1990). *Adiantum multifidum* Sw.: 85 (1801). Type: Promont. bonae spei, *Thunberg s.n.* [S!, lecto., designated by Schelpe (1969b)].

*Adiantum glabrum* Poir.: 144 (1810). Type: Cape Peninsula, Table Mountain, *sine coll. s.n.* (P-JU 1433, holo.).

*Cheilanthes multifida* (Sw.) Sw. var. *flexa* Kunze: 537 (1836). Type: Ad rupes summitatis prope Omsamcaba, *Drège s.n.* [LZ†; B 395D!, lecto., designated by Antony (1984); L, isolecto.].

*Cheilanthes refracta* Pappe & Raws.: 34 (1858). Type: In Griqualand, 1857, *R. Moffatt s.n.* (not located).

*Cheilanthes bolusii* Baker: t. 1636 (1886a); Sim: 89 (1892); Sim: 234 (1915). Type: Cape Colony; south-western district on the banks of the Breede River at Darling bridge, 10/1886, *Bolus 2801* (K, holo.; BOL!, iso.).

*Cheilanthes multifida* (Sw.) Sw. var. *lacerata* N.C. Anthony & Schelpe: 153 (1982); Schelpe & Anthony: 137 (1986); Burrows: 152 (1990). Type: Transvaal, Mariepskop, near summit of mountain, 6 000 ft, 05/12/1957, *H.G. Schweikerd 2428* (BOL!, holo., 2-sheets).

**ILLUSTRATION:** Burrows: t. 36, fig. 153, 153a, b (1990).

Terrestrial or epilithic, in seasonally moist rocky outcrops, sheet rock, riverine and dry forests and montane grassveld, 500–2 340 m.

**DISTRIBUTION:** Angola, Burundi, Democratic Republic of the Congo, Kenya, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

20. *Cheilanthes namaquensis* (Baker) Schelpe & N.C. Anthony in Contributions from the Bolus Herbarium 10: 155 (1982); Schelpe & Anthony: 127 (1986); Burrows: 144 (1990). *Pellaea namaquensis* Baker: 199 (1874b); Sim: 99 (1892); Sim: 205 (1915); Launert: 7.7 (1969); Jacobsen: 280 (1983). *Allosorus namaquensis* (Baker) Kuntze: 806 (1891). Type: Namaqualand, *Barkly s.n.* (K!, holo.; GRA, SAM!, iso.).

**ILLUSTRATION:** Burrows: t. 33, fig. 146, 146a (1990).

Epilithic, in exposed or sheltered rock crevices, on dryish slopes, exposed or partially shaded, 200–700 m.

**DISTRIBUTION:** Namibia and South Africa.

21. *Cheilanthes nielsii* W. Jacobsen, The ferns and fern allies of southern Africa: 252, t. 182 (1983). Type: Transvaal, Potgietersrus, farm Goedgelegen 194LR, *Jacobsen 5126* (PRE, holo.).

**ILLUSTRATION:** Burrows: t. 30, fig. 138, 138a (1990).

Terrestrial or epilithic, in rock crevices and at boulder bases on rocky slopes, seasonally moist, 800–1 100 m.

**DISTRIBUTION:** Namibia and South Africa.

22. *Cheilanthes parviloba* (Sw.) Sw., Synopsis filicum: 128, 331 (1806); Sim: 85 (1892); Sim: 230 (1915); Launert: 7.3 (1969); Jacobsen: 260 (1983); Schelpe & Anthony: 117 (1986); Burrows: 139 (1990). *Adiantum parvilobum* Sw.: 85 (1801). *Cheilanthes hirta* Sw. var. *parviloba* (Sw.) Kunze: 541 (1836). Type: Promont. bonae spei, *sine coll. s.n.* (S!, holo., left hand specimen only).

**ILLUSTRATION:** Burrows: t. 30, fig. 139, 139a (1990).

Terrestrial or epilithic, in exposed or partially shaded rock crevices and at boulder bases on rocky slopes in areas of low rainfall, 200–2 450 m.

**DISTRIBUTION:** Namibia and South Africa.

23. *Cheilanthes pentagona* Schelpe & N.C. Anthony in Contributions from the Bolus Herbarium 10: 152 (1982); Schelpe & Anthony: 137 (1986); Burrows: 152 (1990). Type: South West Africa, Grootfontein, 5 mls east from Otavi, locally common in dolomite rock crevices, S aspect, 5 200 ft, 16/07/1954, *Schelpe 4820* (BOL!, holo.; GH, K, MO, PRE, iso.).

**ILLUSTRATION:** Burrows: t. 36, fig. 154, 154a (1990).

Epilithic, in crevices of dolomitic rocks, mostly partially shaded, 1 000–1 750 m.

**DISTRIBUTION:** Angola, Namibia, South Africa and Zimbabwe.

24. *Cheilanthes perlanata* (Pic. Serm.) Kornaš, Distribution and ecology of the Pteridophytes of Zambia: 51 (1979). *Notholaena perlanata* Pic. Serm.: 417, 418 (1972b). Type: Congo: Mines de Lupoto (Elizabethville), 13/07/1948, *A. Schmitz 1855* ex Herbario Yangambiensi (Herb. PIC. SERM. 19657). Congo: Anciennes mines de Lupoto, env. 30 km Est d'Elizabethville, dans les anfractuosités de rochers, 13/07/1948, *A. Schmitz 1855.B* (BR, para.); Congo: Récolté au même endroit que 1855 du 13 juillet 1948, 16/04/1950, *A. Schmitz 1855.A* (BR, para.).

**ILLUSTRATION:** Pichi Sermolli: t. 9, fig. A–F (1972b).

Epilithic, in seasonally moist rock crevices on rocky outcrops in miombo woodland, 1 000–1 400 m.

**DISTRIBUTION:** Burundi, Democratic Republic of the Congo and Zambia.

25. **Cheilanthes quadripinnata** (Forssk.) Kuhn, *Filices africanæ*: 74 (1868); Schelpe & Anthony: 133 (1986); Burrows: 149 (1990). *Pteris quadripinnata* Forssk.: CXXIV, 186 (1775). *Allosorus quadripinnatus* (Forssk.) C.Presl: 154 (1836). *Pteridella quadripinna* (Forssk.) Mett. ex Kuhn: 16 (1879). *Pellaea quadripinnata* (Forssk.) Prantl: 420 (1882); Sim: 202 (1915); Launert: 7.7 (1969); Schelpe: 133 (1970); Schelpe & Diniz: 136 (1979); Jacobsen: 288 (1983); Burrows: 149 (1990). Type: Yemen, montium Hadiensium, *Forsskål s.n.* (missing).

*Pteris consobrina* Kunze: 526 (1836). *Pellaea consobrina* (Kunze) Hook.: 145 (1858). *Allosorus consobrinus* (Kunze) Pappe & Raws.: 31 (1858); Sim: 97 (1892). Type: Stormberg et Wittebergen, in rupestribus, 1 800–2 000 m, *Drège s.n.* [LZ†; B 391, lecto., designated by Anthony (1984); BM!, islecto.].

*Cheilanthes triangula* Kunze: 536 (1836); Type: Compasberg, in rupestribus umbrosis, 5–6 000 ped., *Drège s.n.* (LZ†; B 393, lecto., designated by Anthony (1984); BM!, L, islecto.).

*Cheilanthes atherstonii* Hook.: 107 (1852). Type: Somerset East, *Atherstone s.n.* (K, holo.).

*Cheilanthes firma* T.Moore: 225 (1853). Type: Natal, *Plant s.n.* (BM, holo.).

*Cheilanthes linearis* T.Moore: 226 (1853). Type: Natal, *Plant s.n.* (BM, holo.).

**ILLUSTRATION:** Fig. 7R; Burrows: t. 35, fig. 151, 151a (1990).

Terrestrial or epilithic, in rock crevices, at boulder bases, in forest margins and in montane grasslands, exposed or partially shaded, 700–2 900 m.

**DISTRIBUTION:** Cameroon, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

26. **Cheilanthes rawsonii** (Pappe) Mett. ex Kuhn, *Filices africanæ*: 75 (1868); Sim: 220 (1915); Jacobsen: 250 (1983); Schelpe & Anthony: 113 (1986); Burrows: 134 (1990). *Notholaena rawsonii* Pappe: 42 (1858); Sim: 206 (1892); Launert: 7.5 (1969). Type: Namaqualand, between Spectakel and Kommaggas, *Rev. Whitehead s.n.* (BM, holo.; K!, S, iso.).

**ILLUSTRATION:** Fig. 7O–Q; Burrows: t. 31, fig. 135, 135a (1990).

Terrestrial or epilithic, in sheltered rock crevices and at boulder bases in areas of low rainfall, exposed or partially shaded, 300–1 500 m.

**DISTRIBUTION:** Namibia and South Africa.

27. **Cheilanthes robusta** (Kunze) R.M.Tryon in Contributions from the Gray Herbarium, Harvard University 143: 72 (1942); Schelpe & Anthony: 123 (1986); Burrows: 140 (1990). *Allosorus robustus* Kunze: 502, 503 (1836). *Onychium robustum* (Kunze) Fée: 132 (1852b). *Cryptogramma robusta* (Kunze) Pappe & Raws.: 32 (1858). *Pellaea robusta* (Kunze) Hook.: 147 (1858); Sim: 95 (1892); Launert: 7.7 (1969); Jacobsen: 281 (1983). *Doryopteris robusta* (Kunze) Diels: 269 (1899); Sim: 217 (1915). Type: In editioribus saxosis terrae Namaqua prope Goedemanskraal, *Drège s.n.* [LZ†; SAM!, lecto., designated by Anthony (1984); BM, K, NY, islecto.].

**ILLUSTRATION:** Schelpe & Anthony: t. 38, fig. 3 (1986).

Terrestrial or epilithic, in shallow soils in area of low seasonal rains, exposed or lightly shaded, 400–700 m.

**DISTRIBUTION:** Namibia and South Africa.

28. **Cheilanthes schimperi** Kunze, *Die Farnkräuter* 1: 52, t. 26 (1840). *Hypolepis schimperi* (Kunze) Hook.: 70 (1852); Sim: 239 (1915). *Aspidotis schimperi* (Kunze) Pic.Serm.: 326 (1950); Schelpe: 113 (1970); Schelpe: 89 (1977); Schelpe & Diniz: 113 (1979); Jacobsen: 233 (1983); Burrows: 126 (1990). Type: Abyssinia; in monte Scholoda, *Schimper s.n.* (not located); prope Gafta, *Schimper 1207* (W, syn.); prope Djeladjeranne, in declivibus versus fluvium Tacaze sub rupibus impendentibus, 01/08/1840, *Schimper 1651* (W, syn.); prope Keren, *Steudner s.n.* (missing); inter Tschelga et Woechni, *Steudner s.n.* (missing).

**ILLUSTRATION:** Burrows: t. 35, fig. 128, 128a (1990).

Terrestrial or epilithic, on dryish rocky hillsides, on termite mounds in miombo woodland and occasionally in riverine forests, sheltered or exposed, 800–1 750 m.

**DISTRIBUTION:** Angola, Cameroon, Democratic Republic of the Congo, Ethiopia, Malawi, Mozambique, Nigeria, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

29. **Cheilanthes similis** Ballard in Kew Bulletin 12: 47 (1957); Schelpe: 124 (1970). Type: Northern Rhodesia. Mwinilunga Distr., Luakela Falls, Mwinilunga, on road and by rocks on slope in open Brachystegia woodland, *Milne-Redhead 4351* (K, holo.; BM, iso.).

Epilithic, in seasonally moist rocky slopes in miombo woodland, exposed or partially shaded, 1 000–1 300 m.

**DISTRIBUTION:** Burundi, Congo, Democratic Republic of the Congo and Zambia.

30. **Cheilanthes viridis** (Forssk.) Sw., *Synopsis filicum*: 127 (1806). *Pteris viridis* Forssk.: CXXIV, 186 (1775). *Adiantum viride* (Forssk.) Vahl: 104 (1794). *Pteridella viridis* (Forssk.) Mett. ex Kuhn: 16 (1879). *Pellaea viridis* (Forssk.) Prantl: 420 (1882); Sim: 207 (1915); Launert: 7.8 (1969); Schelpe: 135 (1970); Schelpe & Diniz: 138 (1979); Jacobsen: 283 (1983); Schelpe & Anthony: 129 (1986). Type: Yemen, montium Hadiensium, *Forsskål s.n.* (missing).



*Pteris hastaefolia* Schrad.: 917 (1818). Type: Cape, Hesse *s.n.* (GOET!, holo.).

*Cheilanthes hastata* (L.f.) Kunze var. *stenophylla* Kunze: 533 (1836). Type: In sylvanum initio ad Krakakamma et in montibus Stadensriviersberge, denique prope Philipstown et in mont. Winterberg, *Ecklon s.n.* (LZ+).

*Pellaea hastata* sensu Sim: 101 (1892).

#### KEY TO THE VARIETIES:

- 1a Secondary rachises and petiolules glabrous or with few appressed paleae ..... 30.3. var. **glaucia**  
 1b Secondary rachises and petiolules with short unicellular to multicellular hairs that abaxially often extend to the lamina and the costules:  
   2a Lamina 2-pinnate to 4-pinnate; pinnae to 20 x 7 mm ..... 30.1. var. **viridis**  
   2b Lamina 2-pinnate to 3-pinnate; pinnae to 30 x 15 mm ..... 30.2. var. **macrophylla**

30.1. var. **viridis**, Burrows: 146 (1990).

Sexual or apogamous.

**ILLUSTRATION:** Burrows: t. 34, fig. 149, 149a, b (1990).

Terrestrial or epilithic, in moist forest margins, seasonally moist forest, and rocky hillsides, mostly shaded, 50–1 900 m.

**DISTRIBUTION:** Burundi, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Tanzania and Zimbabwe. Also in Arabia, Madagascar and India.

30.2. var. **macrophylla** (Kunze) Schelpe & N.C.Anthony in Contributions from the Bolus Herbarium 10: 155 (1982); Schelpe & Anthony: 131 (1986); Burrows: 148 (1990). *Cheilanthes hastata* (L.f.) Kunze var. *macrophylla* Kunze: 532 (1836). *Cheilanthes macrophylla* (Kunze) Kunze: 307 (1850). *Allosorus hastatus* (L.f.) Prantl var. *macrophylla* (Kunze) Pappe & Raws.: 30 (1858). *Pellaea hastata* (L.f.) Link var. *macrophylla* (Kunze) Hook.: 146 (1858); Sim: 102 (1892). *Pellaea viridis* (Forssk.) Prantl var. *macrophylla* (Kunze) Sim: 208 (1915). Type: Ad catarractam magnam prope Omsamcaba, in umbrosis, *Drège s.n.* [LZ+; K!, lecto., designated by Anthony (1984); B, BM!, islecto.].

Sexual or apogamous.

**ILLUSTRATION:** Burrows: t. 34, fig. 149c–e (1990).

Terrestrial, mostly in seasonally moist forests, deeply shaded, 50–1 700 m.

**DISTRIBUTION:** South Africa and Swaziland.

30.3. var. **glaucia** (Sim) Schelpe & N.C.Anthony in Contributions from the Bolus Herbarium 10: 155 (1982); Schelpe & Anthony: 133 (1986); Burrows: 148 (1990). *Pellaea hastata* (L.f.) Link var. *glaucia* Sim: 30 (1891); Sim: 102 (1892). *Pellaea viridis* (Forssk.) Prantl var. *glaucia* (Sim) Sim: 209 (1915); Schelpe: 110 (1977); Schelpe & Diniz: 138 (1979). Type: South-west of King Williamstown, *Sim s.n.* (PRE, holo.).

*Cheilanthes hastata* (L.f.) Kunze var. *canonica* Kunze: 532 (1836). Type: In rupestribus ad Glenfilling (distr. Albany), *Drège s.n.* (LZ+; B 370!, lecto., designated by Anthony (1984); L, islecto.).

Sexual or apogamous.

**ILLUSTRATION:** Burrows: t. 34, fig. 149f–h (1990).

Terrestrial or epilithic, in seasonally moist crevices on rock outcrops and along boulder bases, exposed or lightly shaded, 500–1 800 m.

**DISTRIBUTION:** Angola, Botswana, Kenya, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

**0136050 ALEURITOPTERIS** Fée, Mémoires sur la familles des Fougères 5: 153 (1852b). *Cheilanthes* Sw. subgen. *Aleuritopteris* (Fée) W.-C.Shieh: 213 (1973). Type: *Aleuritopteris farinosa* (Forssk.) Fée; (now *Cheilanthes farinosa* (Forssk.) Kaulf.; *Pteris farinosa* Forssk.).

Plants terrestrial or epilithic. *Rhizome* solenostelic or dictyostelic, short and erect, or long and creeping. *Fronds* monomorphic, caespitose or approximate; stipe and rachis adaxially shallowly sulcate, proximally not open to the sulci of the lower order axes, nitid; lamina pinnately compound, anadromous or isodromous; pinnae basiscopically developed; hypostomatic, stomata of the anomocytic type, aerophore lines along the axes inconspicuous; venation free, catadromous, pinnately branched. *Indumentum* composed of capitate glandular hairs exuding a coloured farina occurring abaxially on the lamina, and broadly attached, mostly entire paleae terminating in a small thin-walled cell occurring on the rhizome and frond axes. *Sori* small, marginal, at vein endings; indusium a strongly modified margin; sporangium stalk simple, 3-seriate below capsule; capsule with 14–(17)–23 indurated annulus cells. *Spores* tetrahedral-globose, trilete, coarsely cristate. Chromosome number based on  $2n = 120$ .

A genus of approximately 15 species occurring throughout the temperate parts of especially the northern hemisphere. Saiki (1984) estimated the genus to consist of about 40 species. The centre of diversity for the genus is in the Sino-Himalayas. *Aleuritopteris* is often included in *Cheilanthes* (Tryon & Tryon 1982b), but preliminary *rbcl* studies showed that the latter is polyphyletic and that the *Aleuritopteris* species cannot be grouped with *Cheilanthes s. str.* (Gastony & Rollo 1995).

## KEY TO THE SPECIES:

- Lamina abaxially with a whitish or pale yellow farina ..... 1. **A. farinosa**  
 Lamina abaxially with an orange-yellow farina ..... 2. **A. welwitschii**

1. **Aleuritopteris farinosa** (Forssk.) Fée, Mémoires sur la familles des Fougères 5: 154 (1852b). *Pteris farinosa* Forssk.: CXXIV, 187 (1775). *Cheilanthes farinosa* (Forssk.) Kaulf.: 212 (1824); Sim: 235 (1915); Schelpe: 122 (1970); Schelpe: 99 (1977); Jacobsen: 247 (1983); Burrows: 128 (1990). *Allosorus farinosus* (Forssk.) C.Presl: 153 (1836). *Cassebeera farinosa* (Forssk.) J.Sm.: 159 (1841b). Type: Yemen, montium Hadiensium media inhabitant, Forsskål s.n. (?LD).

*Aleuritopteris flava* Y.Saiki: 86 (1984). Type: Tanzania, Morogoro, Uluguru Mts., 1 250 m, Schlieben 3223 (Z, holo.).

ILLUSTRATIONS: Fig. 7K & L; Burrows: t. 26, fig. 129, 129a (1990).

Terrestrial, epilithic or epiphytic, in moist evergreen forests and on cliffs near waterfalls, 750–1 500 m.

DISTRIBUTION: Angola, Burundi, Cameroon, Guinea, Kenya, Malawi, Nigeria, Rwanda, Sierra Leone, Tanzania, Uganda, Zambia and Zimbabwe.

2. **Aleuritopteris welwitschii** (Hook. ex Baker) Ching in Hongkong Naturalist 10: 202 (1941a). *Cheilanthes welwitschii* Hook. ex Baker: 142 (1867b); Schelpe: 99 (1977); Schelpe & Diniz: 124 (1979); Burrows: 154 (1990). Type: Angola, Pungo Andongo, 2 400–3 800 p. alt. In montibus gneissicis, 12/1856, Welwitsch 148 (K, holo.).

*Cheilanthes mossambicensis* Schelpe: 183 (1964); Schelpe: 123 (1970); Jacobsen: 248 (1983). Type: Mozambique, Ribáuè, 1½ mls SW of Poste Agrícola, 1 800 ft, 20/07/1952, Schelpe & Leach 11421 (BOL!, holo.; K, SRGH!, iso.).

ILLUSTRATION: Burrows: t. 26, fig. 157, 157a (1990).

Terrestrial or epilithic, in seasonally moist conditions on rock outcrops, 550–1 800 m.

DISTRIBUTION: Angola, Malawi, Mozambique, Tanzania and Zimbabwe.

**0136800 PELLAEA** Link, Filicum species: 59 (1841), nom. cons. Type: *Pellaea atropurpurea* (L.) Link; *Pteris atropurpurea* L.

*Pellaeopsis* J.Sm.: 289 (1875). Type: *Pellaeopsis articulata* (Kaulf. ex Spreng.) J.Sm.; *Pteris articulata* Kaulf. ex Spreng. (now *Pellaea angulosa* (Bory ex Willd.) Baker; *Pteris angulosa* Bory ex Willd.).

*Pteridella* Mett. ex Kuhn: 13 (1879). *Pellaea* Link sect. *Pteridella* (Mett. ex Kuhn) Prantl: 417 (1882). *Pellaea* Link subgen. *Pteridella* (Mett. ex Kuhn) C.Chr.: xl (1905). Type: *Pteridella doniana* (J.Sm. ex Hook.) Mett. ex Kuhn; *Pellaea doniana* Hook.

Plants terrestrial or epilithic. *Rhizome* solenostelic, short and decumbent, or long and creeping, frequently branched. *Fronds* approximate to widely spaced, monomorphic or dimorphic; stipe terete or adaxially sulcate; lamina pinnately compound, anadromous or catadromous; ultimate segments sessile or short-stalked, articulate at the pinna or segment base, mostly glabrous; hypostomatic, stomata of the anomocytic type; venation free or anastomosing. *Indumentum* fugaceous, composed of simple, short or long, uniseriate or pluriseriate hairs ending in an unmodified cell, or a small or enlarged thin-walled apical cell occurring along the axes and lamina and narrow, entire or subentire, concolorous paleae ending in an undifferentiated, or small thin-walled cell occurring on the rachis and axes. *Sporangia* at vein ends or in a soral line along a near marginal vascular commissure; capsule with 14–(18)–20 indurated annulus cells, covered by slightly or highly modified marginal flaps or a continuous marginal indusium. *Spores* tetrahedral-globose, trilete, variously sculptured, 25–70 µm in diameter. *Gametophyte*: mature thallus cordate, with a thickened midrib, glabrous; antheridia borne ventrally on midrib, 3-celled; archegonium neck curved towards the posterior. Chromosome number based on  $2n = 58$  or 60.

A genus of approximately 35 species largely confined to the south-eastern United States of America, Mexico, Africa, Madagascar and the Indian subcontinent. The genus is divided into four sections, two of them occurring on the African subcontinent.

## KEY TO THE SECTIONS:

- Rhizome long-creeping; hairs and paleae not ending in a differentiated apical cell ..... 1. sect. **Pellaea**  
 Rhizome short and decumbent; hairs and paleae mostly ending in a small or enlarged thin-walled cell ..... 2. sect. **Holcochaena**

1. Section **Pellaea**

**Pellaea rufa** A.F.Tryon in Annals of the Missouri Botanical Garden 42: 101, t. 7 (1955); Jacobsen: 276 (1983); Schelpe & Anthony: 143 (1986); Burrows: 169 (1990). Type: Laingsburg, Ngaap Kop, Compton 16402 (US, holo.; NBG!, iso.).

Chromosome number:  $2n = 116$  (Gastony 1990).

ILLUSTRATIONS: Fig. 7X–Z; Schelpe & Anthony: t. 45, fig. 1, 1a (1986).

Terrestrial or epilithic, a xerophytic species growing in areas of low rainfall, in rock crevices, at boulder bases and under low scrub, mostly partially shaded, 900–1 200 m.

DISTRIBUTION: South Africa.

2. Section **Holcochaena** Hook. & Baker, Synopsis filicum: 153 (1867). Type: *Pellaea articulata* (Kaulf. ex Spreng.) Baker; *Pteris articulata* Kaulf. ex Spreng. (now *Pellaea angulosa* (Bory ex Willd.) Baker; *Pteris angulosa* Bory ex Willd.).

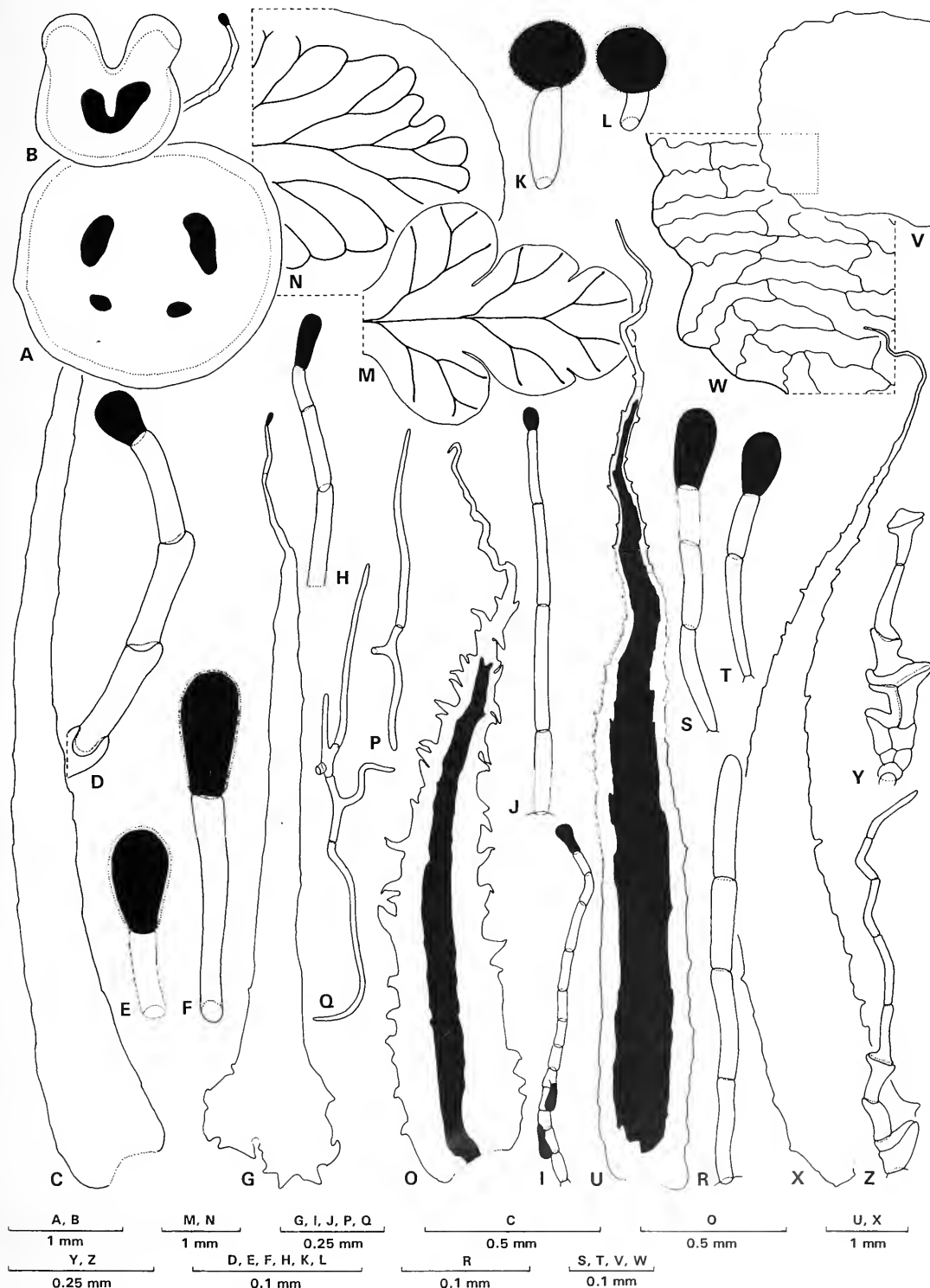


FIGURE 7A–Z, Pteridaceae. A–F, *Pityrogramma calomelanos* var. *aureoflava*, A, cross section of the stipe; B, cross section of the rachis; C, stipe palea; D, apex of C showing the cellular structure; E & F, farinose hairs occurring abaxially on the lamina, Roux 578 (NBG); G & H, *Actiniopteris radiata*, G, stipe palea, H, apex of G showing the cellular structure, Van Jaarsveld 5982 (NBG); I & J, *Cheilanthes contracta*, I, lamina hair; J, stipe hair, Roux 121 (NBG); K & L, *Aleuripteris farinosa*, farinose hairs from the abaxial surface of lamina, Taylor 3105 (NBG); M, *Cheilanthes hirta*, section of the fertile pinna showing the free venation, Roux 931 (NBG); N, *C. involuta* var. *involuta*, section of the fertile pinnule showing anastomosing veins (indusium unfolded), Roux 2342 (NBG); O–Q, *C. rawsonii*, O, rhizome palea; P & Q, stipe hairs, Van Jaarsveld 13457 (NBG); R, *C. quadripinnata*, paraphyses, Roux 2240 (NBG); S & T, *Pellaea calomelanos* var. *calomelanos*, paraphyses, Roux 1481 (NBG); U–W, *P. pteroides*, U, rhizome palea; V, indusium; W, section of V showing the cellular structure, Roux 92 (NBG); X–Z, *P. rufa*, stipe palea and hairs, Fellingham 1421 (NBG). Scale bars: A & B, 1 mm; M & N, 1 mm; G, I, J, P, Q, 0.25 mm; C, 0.5 mm; O, 0.5 mm; U & X, 1 mm; Y & Z, 0.25 mm; D, E, F, H, K, L, 0.1 mm; R, 0.1 mm; S, T, V, W, 0.1 mm.

## KEY TO THE SPECIES:

- 1a Ultimate segments rotund, ovate or deltate:  
 2a Stipe and rachises adaxially sulcate ..... 7. *P. leucomelas*  
 2b Stipe and rachises terete:  
 3a Pinnules ovate; indusia oblong, discontinuous ..... 10. *P. pteroides*  
 3b Pinnules rotund to broadly hastate; indusium linear, continuous ..... 4. *P. calomelanos*
- 1b Ultimate segments oblong to lanceolate:  
 4a Rachis thinly villous with hairs and narrow paleae ..... 9. *P. pectiniformis*  
 4b Rachis glabrous or minutely pubescent adaxially:  
 5a Veins anastomosing:  
 6a Fronds broadly deltate ..... 2. *P. angulosa*  
 6b Fronds lanceolate ..... 6. *P. dura*
- 5b Veins free:  
 7a Fronds 3-pinnate, deltate ..... 3. *P. boivinii*  
 7b Fronds 1-pinnate to 2-pinnate, oblong, linear or lanceolate:  
 8a Lamina hirsute or subglabrous, never 2-pinnate if glabrous ..... 8. *P. longipilosa*  
 8b Lamina glabrous, 1-pinnate:  
 9a Pinnae to 90 mm long x 9 mm wide; segments abaxially glandular ..... 1. *P. angolensis*  
 9b Pinnae to 140 mm long x 25 mm wide; segments abaxially not glandular ..... 5. *P. doniana*

1. *Pellaea angolensis* Schelpe in García de Orta, *Série de Botânica* 3: 53, 54 (1976); Schelpe: 107 (1977). Type: Angola, Cuanza Sul, Amboim, arredares da Gabela, lugares rochosos, húmidos e sombrios, 700 m, 01/10/1971, *M. da Silva* 3849 (LUAU, holo.; COL, iso.).

Terrestrial or epilithic, in seasonally moist rock crevices, 600–800 m.

DISTRIBUTION: Angola.

2. *Pellaea angulosa* (Bory ex Willd.) Baker, *Synopsis filicum*, 2nd edn: 153 (1874a); Schelpe: 131 (1970); Schelpe & Diniz: 133 (1979); Jacobsen: 272 (1983); Burrows: 172 (1990). *Pteris angulosa* Bory ex Willd.: 377 (1810). *Pteridella angulosa* (Bory ex Willd.) Mett ex Kuhn: 15 (1879). *Allosorus angulosus* (Bory ex Willd.) Kuntze: 806 (1891). Type: Réunion, *Bory de St. Vincent s.n.* (B-W 19983, holo.).

*Pteris articulata* Kaulf. ex Spreng.: 76 (1827). *Litobrochia articulata* (Kaulf. ex Spreng.) C.Presl: 149 (1836). *Doryopteris articulata* (Kaulf. ex Spreng.) Fée: 133 (1852b). *Pellaea articulata* (Kaulf. ex Spreng.) Baker: 153 (1867b). *Pellaeopsis articulata* (Kaulf. ex Spreng.) J.Sm.: 290 (1875). Type: Mascarene Is., *sine coll. s.n.* (not located).

ILLUSTRATION: Schelpe: t. 40, fig. A1–3 (1970).

Terrestrial, in dry and moist forests, shaded, 1 200–1 350 m.

DISTRIBUTION: Malawi, Mozambique, Tanzania and Zimbabwe. Also in the Madagascan region.

3. *Pellaea boivinii* Hook., *Species filicum* 2: 147, t. 118A (1858); Sim: 98 (1892); Sim: 204 (1915); Schelpe: 131 (1970); Jacobsen: 274 (1983); Schelpe & Anthony: 145 (1986); Burrows: 168 (1990). *Pteris boivinii* (Hook.) Bedd.: t. 36 (1865). *Allosorus boivinii* (Hook.) Kuntze: 806 (1891). Type: Madagascar, Nossibé, *Boivin s.n.* [K!, lecto., designated by Schelpe (1969b)].

Apogamous.

ILLUSTRATION: Schelpe & Anthony: t. 47, fig. 2 (1986).

Terrestrial or epilithic, in seasonally moist rock crevices and in shallow soil on sheetrock, exposed or partially shaded, 700–2 250 m.

DISTRIBUTION: Botswana, Kenya, South Africa, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region and Sri Lanka.

4. *Pellaea calomelanos* (Sw.) Link, *Filicum species*: 61 (1841); Sim: 104 (1892); Launert: 7.6 (1969); Schelpe: 132 (1970); Schelpe: 108 (1977); Schelpe & Diniz: 104 (1979); Jacobsen: 227 (1983); Schelpe & Anthony: 147 (1986). *Pteris calomelanos* Sw.: 70 (1801). *Allosorus calomelanos* (Sw.) C.Presl: 153 (1836). *Platyloma calomelanos* (Sw.) J.Sm.: 21 (1846). *Notholaena calomelanos* (Sw.) Keyserl.: 29 (1873). Type: e Cap. b. Spei, *Thunberg s.n.* (UPS-THUNB 24895!, holo.).

*Pellaea hastata* sensu Sim: 211 (1915).

## KEY TO THE VARIETIES:

- Pinnules < 30 mm broad; fronds ovate in outline ..... 4.1. var. *calomelanos*  
 Pinnules > 30 mm broad; fronds triangular in outline ..... 4.2. var. *swynertoniana*

4.1. var. *calomelanos*, Burrows: 176 (1990).

Apogamous.

ILLUSTRATIONS: Fig. 75 & T; Schelpe & Anthony: t. 47, fig. 1 (1986).

Terrestrial or epilithic, in seasonally moist conditions, in rock crevices, at boulder bases and shallow soils on sheetrock, exposed or lightly shaded, 50–2 340 m.

DISTRIBUTION: Angola, Botswana, Burundi, Democratic Republic of the Congo, Ethiopia, Kenya, Lesotho, Malawi, Mozambique,

Namibia, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

4.2. var. **swynnertoniana** (Sim) Schelpe in Journal of South African Botany 30: 187 (1964); Schelpe: 133 (1970); Schelpe & Diniz: 136 (1979); Jacobsen: 279 (1983); Burrows: 176 (1990). *Pellaea swynnertoniana* Sim: 213 (1915). Type: Rhodesia, in silva Chirinda, *Swynnerton 850* (K, holo.).

ILLUSTRATION: Burrows: t. 176b, c (1990).

Terrestrial or epilithic, in seasonally moist miombo woodland, partially or densely shaded, 1 100–1 600 m.

DISTRIBUTION: Malawi, Mozambique, Tanzania and Zimbabwe.

5. *Pellaea doniana* J.Sm. ex Hook., Species filicum 2: 137, t. 125, fig. A (1858); Sim: 211 (1915); Schelpe: 129 (1970); Schelpe: 106 (1977); Schelpe & Diniz: 131 (1979); Jacobsen: 271 (1983); Burrows: 172 (1990). *Pteris doniana* (J.Sm. ex Hook.) Kuhn: 80 (1868). *Pteridella doniana* (J.Sm. ex Hook.) Mett. ex Kuhn: 13 (1879). *Allosorus doniana* (J.Sm. ex Hook.) Kuntze: 806 (1891). Type: São Tomé, *Don s.n.* (not located).

ILLUSTRATION: Schelpe: t. 19, fig. 1, 2 (1977).

Terrestrial or epilithic, in seasonally or partially moist conditions in riverine scrub, on rock outcrops and in miombo woodland, mostly shaded, 600–1 650 m.

DISTRIBUTION: Angola, Annobon, Benin, Bioko, Burundi, Cameroon, Central African Republic, Chad, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Principe, Rwanda, São Tomé, Senegal, Sierra Leone, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Seychelles.

6. *Pellaea dura* (Willd.) Hook., Species filicum 2: 139, t. 113A (1858); Sim: 198 (1915); Schelpe: 132 (1970); Schelpe: 108 (1977); Schelpe & Diniz: 134 (1979); Jacobsen: 273 (1983); Schelpe & Anthony: 143 (1986); Burrows: 170 (1990). *Pteris dura* Willd.: 376 (1810). *Allosorus durus* (Willd.) C.Presl: 153 (1836). *Litobrochia dura* (Willd.) T.Moore: 44 (1857). *Pteridella dura* (Willd.) Mett. ex Kuhn: 14 (1879). Type: Habitat in insula Borboniae, *Bory de St. Vincent s.n.* (B-W 19982!, holo.).

*Pteris burkeana* Hook.: 213 (1858). *Pellaea burkeana* (Hook.) Baker: 153 (1867b); Sim: 105 (1892). *Pellaeopsis burkeana* (Hook.) J.Sm.: 290 (1875). Type: Transvaal, Magaliesberg, *Burke s.n.* (K, holo.).

#### KEY TO THE VARIETIES:

|                                            |                          |
|--------------------------------------------|--------------------------|
| Lamina and rachis abaxially glabrous ..... | 6.1. var. <b>dura</b>    |
| Lamina and rachis abaxially pilose .....   | 6.2. var. <b>holstii</b> |

#### 6.1. var. **dura**

Sexual or apogamous.

ILLUSTRATION: Schelpe & Anthony: t. 46, fig. 2 (1986).

Terrestrial or epilithic, on seasonally moist earth banks, on rock outcrops and at boulder bases, partially shaded, 700–1 500 m.

DISTRIBUTION: Angola, Burundi, Kenya, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. Also in East Africa and the Madagascan region.

6.2. var. **holstii** (Hieron.) Schelpe in Contributions from the Bolus Herbarium 1: 79 (1969b). *Pteridella holstii* Hieron.: 78 (1895). Type: Tanganyika, Usambara, Matai, *Holst 2543* [B, lecto., designated by Schelpe (1969b); K, isolecto.].

ILLUSTRATION: Tardieu-Blot: t. 16, fig. 1, 2 (1964b).

Epilithic, on seasonally moist earth banks and in rock crevices, partially shaded, 700–1 500 m.

DISTRIBUTION: Central African Republic, Gabon, Tanzania and Zambia.

var. **latipinna** Schelpe is confined to Nigeria.

7. *Pellaea leucomelas* (Mett. ex Kuhn) Baker, Synopsis filicum, 2nd edn: 478 (1874a); Sim: 103 (1892); Sim: 210 (1915); Schelpe & Anthony: 147 (1986). *Pteris leucomelas* Mett. ex Kuhn: 83 (1868). *Pteridella leucomelas* (Mett. ex Kuhn) Mett. ex Kuhn: 14 (1879). *Allosorus leucomelas* (Mett. ex Kuhn) Kuntze: 806 (1891). *Pellaea calomelanos* (Sw.) Link var. *leucomelas* (Mett. ex Kuhn) J.E.Burrows: 177 (1990). Type: Africa australis, *Breutel s.n.* (LZt; B, icon).

ILLUSTRATION: Burrows: t. 176d, e (1990).

Terrestrial or epilithic, in rock crevices and at boulder bases on north-facing, seasonally moist slopes, exposed or partially shaded, 150–1 600 m.

DISTRIBUTION: South Africa.

8. *Pellaea longipilosa* Bonap., Notes ptéridologiques 15: 33 (1934); Schelpe: 129 (1970); Schelpe & Diniz: 132 (1979); Jacobsen: 273 (1983); Burrows: 170 (1990). Type: Soudan, Angola-Égyptien, Rejat, *Schantz 944* (US, holo.).

**ILLUSTRATION:** Burrows: t. 171, 171a (1990).

Terrestrial or epilithic, on seasonally moist rock outcrops in miombo woodland, lightly shaded, 600–1 650 m.

**DISTRIBUTION:** Burundi, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

9. **Pellaea pectiniformis** Baker, Synopsis filicum, 2nd edn: 147 (1874a), nom. nov. for *Pteris pectiniformis* Godet ex Mett.: 87 (1868), non Goldm. (1843); Sim: 95 (1892); Schelpe: 128 (1970); Schelpe: 104 (1977); Schelpe & Diniz: 131 (1979); Jacobsen: 270 (1983); Schelpe & Anthony: 145 (1986); Burrows: 174 (1990). *Pteridella pectiniformis* (Baker) Mett. ex Kuhn: 14 (1879). *Allosorus pectiniformis* (Baker) Kuntze: 806 (1891). *Pellaea goudotii* Kunze ex C. Chr.: 480 (1906); Sim: 200 (1915); Launert: 7.7 (1969). Type: Angola, Serra de Oiahoia, *Welwitsch* 191 [K, lecto., designated by Anthony (1984); BM, LISU, isolecto.].

Apogamous.

**ILLUSTRATION:** Schelpe & Anthony: t. 1, 1a (1986).

Terrestrial or epilithic, in rock crevices, shallow soils on sheetrock, and at boulder bases and rocky outcrops in miombo woodland, exposed or lightly shaded, 700–1 800 m.

**DISTRIBUTION:** Angola, Burundi, Democratic Republic of the Congo, Gabon, Malawi, Mozambique, Namibia, Rwanda, South Africa, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region.

10. **Pellaea pteroides** (L.) Prantl in Botanische Jahrbücher für Systematik 3: 420 (1882); Sim: 213 (1915); Jacobsen: 275 (1983); Schelpe & Anthony: 141 (1986); Burrows: 167 (1990). *Adiantum pteroides* L.: 130 (1767a). *Cheilanthes pteroides* (L.) Sw.: 128 (1806); Sim: 80 (1892). *Cassebeera pteroides* (L.) C. Presl: 155 (1836). *Adiantopsis pteroides* (L.) T. Moore: 37 (1857). *Choristosoria pteroides* (L.) Mett. ex Kuhn: 13 (1879). Type: Habitat ad Cap. b. Spei, *sine coll. s.n.* (LINN 1252.14!, holo.).

*Pteris orbiculata* Houtt.: 108 (1783). Type: Cape, M. Houttuyn, Natuurlijke historie 14: 108, t. 96, fig. 3 (1783), icon.

**ILLUSTRATIONS:** Fig. 7U–W; Burrows: t. 168, 168a (1990).

Terrestrial or epilithic, along forest margins and at boulder bases, seasonally moist, mostly lightly shaded, 50–1 500 m.

**DISTRIBUTION:** South Africa.

**0137000 DORYOPTERIS** J.Sm. in Journal of Botany (Hooker) 3: 404 (1841b), nom. cons. Type: *Doryopteris palmata* (Willd.) J.Sm.; *Pteris palmata* Willd. (now *Doryopteris pedata* (L.) Fée var. *palmata* (Willd.) Hicken.

Plants terrestrial or epilithic. *Rhizome* solenostelic, short, erect or suberect, unbranched. *Fronds* monomorphic or dimorphic, caespitose; stipe flat-grooved adaxially, nitid; lamina pedate-pinnatifid, often proliferous; hypostomatic, stomata of the polocytic type; aerophore lines along the axes inconspicuous; venation catadromous, free, pinnately branched, terminating near the margin in conspicuous hydathodes, often with near marginal vascular commissures in fertile fronds. *Indumentum* composed of 2-celled hairs occurring abaxially on the lamina and bicolorous, sessile, centrally lignified, somewhat clathrate paleae confined to the rhizome and the axes. *Sori* marginal, at the vein apices or along a near marginal vascular commissure; indusium a strongly modified margin, interrupted or continuous; sporangium stalk simple, 3-celled below the capsule, capsule with 13–(14)–17 indurated annulus cells; receptacle with short 1- or 2-celled hairs. *Spores* tetrahedral-globose, trilete, rugulate to sparsely cristate. Chromosome number based on  $2n = 60$ .

A genus of about 25 species occurring throughout the tropical parts of the world. *Doryopteris concolor* is often included in *Cheilanthes* (Tryon & Tryon 1981; Anthony 1984; Schelpe & Anthony 1986), but preliminary *rbcl* studies (Gastony & Rollo 1995) showed that the latter is polyphyletic and that *Doryopteris concolor* cannot be grouped with *Cheilanthes* s. str., but rather with species generally included in *Doryopteris*. Two sections are recognized in *Doryopteris*, section *Doryopteris* is characterized by a single vascular bundle at the stipe base, and partially or wholly anastomosing veins. The southern African species all belong to section *Lytoneuron* Klotzsch characterized by two vascular bundles at the stipe base and free venation except for the soriferous vascular commissure that frequently occur in fertile fronds.

Section **Lytoneuron** Klotzsch in Linnaea 20: 343 (1847). Type: *Doryopteris geraniifolia* (Raddi) Klotzsch; *Pteris geraniifolia* Raddi (now *Doryopteris concolor* (Langsd. & Fisch.) Kuhn).

#### KEY TO THE SPECIES:

Fronds monomorphic; stipe and lamina without multicellular hairs ..... 1. **D. concolor**  
Fronds strongly dimorphic; stipe and lamina with multicellular hairs ..... 2. **D. pilosa** var. **gemmifera**

1. **Doryopteris concolor** (Langsd. & Fisch.) Kuhn in Cl. v. d. Decken, Reisen in Ost-Afrika in 1851–1861: 19 (1879); Sim: 214 (1915); Launert: 7.3 (1969); Burrows: 155 (1990). *Pteris concolor* Langsd. & Fisch.: 19, t. 21 (1810). *Pellaea concolor* (Langsd. & Fisch.) Baker: 396 (1870). *Allosorus concolor* (Langsd. & Fisch.) Kuntze: 806 (1891). *Cheilanthes concolor* (Langsd. & Fisch.) R.M.Tryon & A.F.Tryon: 133 (1981); Schelpe & Anthony: 140 (1986). Type: Marquesas Archipelago, Nacahiva Island, *Langsdorff* s.n. (LE, holo.; B 19961, BM, iso.).

*Doryopteris concolor* (Langsd. & Fisch.) Kuhn var. *kirkii* (Hook.) R.E.Fr.: 4 (1914); Schelpe: 121 (1970); Schelpe: 96 (1977); Schelpe & Diniz: 122 (1979); Jacobsen: 245 (1983). *Cheilanthes kirkii* Hook.: t. 81 (1861). *Doryopteris kirkii* (Hook.) Alston: 14 (1956a). Type: Mozambique, Zambesi River, *Kirk* s.n. (K!, holo.).

*Doryopteris concolor* (Langsd. & Fisch.) Kuhn var. *nickelsii* (Tardieu) Schelpe: 212 (1967); Schelpe: 121 (1970); Schelpe & Diniz: 123 (1979); Jacobsen: 246 (1983). *Doryopteris nickelsii* Tardieu: 166 (1948). Type: Central African Republic, Ubangui Shari, Bangui, *Nickles* 95 (P, holo.).

*Pellaea geraniifolia* sensu Sim: 92 (1892), as '*geraniaefolia*'.

**ILLUSTRATION:** Burrows: t. 37, fig. 157, 157a (1990).

Terrestrial or epilithic, in rock crevices, along forest margins, in riverine scrub and on rock outcrops in miombo woodland, mostly seasonally moist conditions, 30–2 000 m.

**DISTRIBUTION:** Angola, Botswana, Burundi, Cameroon, Central African Republic, Ghana, Guinea, Kenya, Malawi, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in Madagascar.

2. *Doryopteris pilosa* (Poir.) Kuhn, in Cl. v. d. Decken, Reisen in Ost-Afrika in 1851–1861, 3: 63 (1879). *Pteris pilosa* Poir.: 717 (1804). *Allosorus pilosus* (Poir.) Kuntze: 806 (1891). *Cheilanthes pilosa* (Poir.) Tardieu: 364 (1953a). Type: Des environs du Gol dans les rochers, Ile de Bourbon, Commerson s.n. (P-LA, holo.).

var. *gemmifera* J.E.Burrows & S.E.Strauss in Bothalia 20: 221 (1990). Type: Transvaal, Thabazimbi Distr., Geelhoutbosch, Strauss 17 (PRE, holo.).

*Doryopteris pilosa* sensu W.Jacobsen & N.Jacobsen: 91 (1988).

**ILLUSTRATION:** : Burrows: t. 37, fig. 157.1, 157.1a, b (1990).

Terrestrial, in riverine scrub along seasonal streams, lightly shaded, 850–1 350 m.

**DISTRIBUTION:** South Africa. Also in the Madagascan region.

**0137700 CONIOGRAMME** Fée, Mémoires sur les familles des Fougères 5: 167, t. 14, fig. 1, 2 (1852b), nom. cons. Type: *Coniogramme javanica* (Blume) Fée; *Gymnogramma javanica* Blume (now *Coniogramme fraxinea* (D.Don) Fée ex Diels; *Diplazium fraxineum* D.Don).

Plants epilithic. *Rhizome* dictyostelic, creeping. *Fronde*s widely spaced, monomorphic; stipe adaxially shallowly sulcate; lamina pinnately compound, glabrous, catadromous; hypostomatic, stomata of the anomo- and polocytic types; venation free, ending in hydathodes near the margin, anadromous. *Indumentum* composed of simple paleae restricted to the rhizome and the stipe base. *Sporangia* borne along the veins, exindusiate, with 18–24 indurated annulus cells; paraphyses few, simple. *Spores* tetrahedral-globose, trilete, papillate, 30–50 µm in diameter. *Gametophyte*: mature thallus cordate, with median midrib and broad wings, glabrous, rhizoids ventral along midrib, with a slightly dilated basal region; antheridium 3-celled, basal cell disk-shaped, dehiscence through a pore in the cap cell; archegonia unknown. Chromosome number based on  $2n = 120$ .

A genus of approximately 20 species ranging from Africa, along the Himalayas to Japan and the Pacific. Based on the studies of Hasebe *et al.* (1995), Pryer *et al.* (1995) and Gastony and Rollo (1998) the genus does not belong in the *Cheilantheoideae*, but should stand as a group on its own. No formal classification is currently available to do this and the genus is therefore retained in the *Cheilantheoideae* as proposed by Tryon *et al.* (1990). Shieh (1973) placed *Coniogramme* in *Adiantaceae* tribus *Gymnopterideae* Shieh together with *Anogramme* and *Pityrogramme*.

*Coniogramme africana* Hieron. in Hedwigia 57: 293 (1916); Schelpe: 102 (1970). Type: Cameroons, near Buea, Preuss 606; Deistel 441; Cameroons, near Mfongu, Ledermann 5890; Tanganyika, Kibosho, Daubenberger s.n., In Rosenst., Fil. Afr. Orient. exs. 51; Tanganyika, Rungwe, near Kymbila, Stolz 905 (B, syn.).

**ILLUSTRATION:** Schelpe: t. 38, fig. 1a, b & 2 (1970).

Epiphytic or epilithic, in moist evergreen montane forests, 1 980 m.

**DISTRIBUTION:** Bioko, Cameroon, Central African Republic, Ethiopia, Kenya, Liberia, Malawi, Nigeria, Rwanda, São Tomé, Tanzania and Uganda.

3. Subfamily **Adiantoideae** (C.Presl) R.M.Tryon in American Fern Journal 76: 184 (1986a). *Filicaceae* L. tribus *Adiantaeae* C.Presl: 139 (1836), as '*Adiantaceae*'. *Adiantaceae* Newman: 5 (1840), nom. cons. Type: *Adiantum* L.

The subfamily is characterized by the veins that enter the strongly modified marginal indusium on which the sporangia are borne. Monogeneric.

**0138500 ADIANTUM** L., Species plantarum 2: 1094 (1753). Lectotype: *Adiantum capillus-veneris* L., designated by J. Smith (1875).

Plants terrestrial or epilithic. *Rhizome* solenostelic or dictyostelic, short and decumbent or long-creeping and branched. *Fronde*s caespitose to distant, monomorphic, pinnately compound or helicoid, often with a proliferating bud at the rachis apex; stipe adaxially shallowly sulcate; lamina pinnately compound or sagittate, glabrous or pubescent, often articulated at the segment base, anadromous; hypostomatic, stomata of the anomocytic type; aerophores poorly developed, as dorso-lateral lines along the axes; venation free. *Indumentum* composed of simple acicular hairs occurring on the axes and lamina surfaces and broadly attached paleae

ending in an undifferentiated apical cell occurring on the rhizome and the stipe. *Sporangia* along and between the veins on a strongly recurved indusoid margin, often with unicellular trichomes among the sporangia; capsule with 15–17 indurated annulus cells. *Spores* tetrahedral-globose, trilete, rugate, rugulate or tuberculate, 25–50 µm in diameter. *Gametophyte*: mature thallus cordate, with an apical meristematic region, midrib distinct, wings broad, glabrous, rhizoids ventrally along the midrib, with a slightly dilated basal region; antheridium 3-celled, basal cell disk-shaped, dehiscence through a pore in the cap cell before collapsing. Chromosome number based on  $2n = 58$  or 60.

A genus of approximately 150 species with a pantropical distribution.

#### KEY TO THE SPECIES:

- 1a Lamina simple or 1-pinnate:
  - 2a Lamina simple ..... 12. **A. reniforme**
  - 2b Lamina 1-pinnate:
    - 3a Rachis pilose:
      - 4a Lamina pilose; veins not ending in the teeth ..... 5. **A. incisum**
      - 4b Lamina glabrous; veins ending in the teeth ..... 3. **A. comoroense**
    - 3b Rachis glabrous:
      - 5a Stipe and rachis with a narrow brown wing ..... 8. **A. mittenii**
      - 5b Stipe and rachis not winged:
        - 6a Pinnae broadly obovate, the outer margin finely denticulate ..... 7. **A. mendoncae**
        - 6b Pinnae orbicular or dimidiate:
          - 7a Pinnae orbicular ..... 6. **A. lunulatum**
          - 7b Pinnae dimidiate ..... 13. **A. schweinfurthii**
  - 1b Lamina 2-pinnate to 4-pinnate:
    - 8a Fronds pedately or helicoidly divided:
      - 9a Fronds glabrous ..... 9. **A. patens**
      - 9b Fronds hispid ..... 4. **A. hispidulum**
    - 8b Fronds pinnately divided:
      - 10a Lamina 2-pinnate ..... 14. **A. vogelii**
      - 10b Lamina 3-pinnate to 4-pinnate:
        - 11a Veins of the sterile pinnules ending in marginal teeth:
          - 12a Rhizome widely creeping; sori orbicular to semi-orbicular ..... 1. **A. aethiopicum**
          - 12b Rhizome short-creeping; sori oblong to lunate ..... 2. **A. capillus-veneris**
        - 11b Veins of the sterile pinnules ending in sinuses between the marginal teeth:
          - 13a Sori lunate; ultimate segments articulated ..... 10. **A. poiretii**
          - 13b Sori suborbicular; ultimate segments not articulated ..... 11. **A. raddianum**

1. **Adiantum aethiopicum** L., *Systema naturae*, 10th edn, 2: 1329 (1759); Sim: 73 (1892); Sim: 248 (1915); Jacobsen: 231 (1983); Schelpe & Anthony: 101 (1986); Burrows: 124 (1990). Type: Cap. b. Spei, *sine coll. s.n.* (LINN 1252.15!, holo.).

ILLUSTRATIONS: Fig. 8A & B; Burrows: t. 126, 126a, b (1990).

Terrestrial, mostly in evergreen forests, deeply shaded, 200–500 m.

DISTRIBUTION: South Africa. Also in Australia, Tasmania, New Caledonia, New Zealand and the Norfolk Islands.

2. **Adiantum capillus-veneris** L., *Species plantarum* 2: 1096 (1753); Sim: 70 (1892); Sim: 245 (1915); Launert: 6.1 (1969); Schelpe: 112 (1970); Schelpe: 88 (1977); Schelpe & Diniz: 111 (1979); Jacobsen: 228 (1983); Schelpe & Anthony: 101 (1986); Burrows: 123 (1990). Type: Francia, *Magnol s.n.* [LINN 1252.9!, lecto., designated by Pichi Sermolli (1957)].

*Adiantum marginatum* Schrad.: 918 (1818). Type: Cape Province, *Hesse s.n.* (LE, holo.).

*Adiantum pseudo-capillus* Fée: 118 (1852b). Type: Habitat ad promontorium Bonae Spei, *Drège s.n.* (missing).

*Adiantum paradiseae* Baker: 558 (1889); Sim: 71 (1892); Sim: 246 (1915). Type: Cape Province, Bedford District, *Paradise s.n.* (K, holo.; PRE, iso.).

ILLUSTRATION: Schelpe & Anthony: t. 30, fig. 2, 2a (1986).

Terrestrial or epilithic, on seasonally or permanently moist cliff faces, on boulders and along streams or moist ditches, exposed or shaded, 20–1 700 m.

DISTRIBUTION: Algeria, Angola, Botswana, Chad, Egypt, Ethiopia, Democratic Republic of the Congo, Kenya, Lesotho, Libya, Malawi, Mali, Morocco, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Near cosmopolitan.

3. **Adiantum comoroense** (Tardieu) Verdc. in *Kew Bulletin* 47: 272 (1991). *Adiantum rhizophorum* Sw. var. *comoroense* Tardieu: 129 (1958a). Type: Comoro Is., Anjouan, *Hildebrandt 1752* [P, lecto., designated by Verdcourt (1991); K, isolecto.].

*Adiantum confine* sensu Peter: 43 (1929).

ILLUSTRATION: Tardieu-Blot: t. 19, fig. 2 (1964a).

DISTRIBUTION: Kenya, Malawi, Tanzania and Uganda. Also in the Comoro Island.



4. ***Adiantum hispidulum*** Sw. in Journal für die Botanik 1800, 2: 82 (1801); Sim: 244 (1915); Schelpe: 111 (1970); Schelpe & Diniz: 110 (1979); Jacobsen: 228 (1983); Schelpe & Anthony: 100 (1986); Burrows: 122 (1990). Type: Australasia, *sine coll.* s.n. (S, holo.).

ILLUSTRATIONS: Fig. 8C & D; Schelpe: t. 36, fig. A (1970).

Terrestrial, on seasonally or permanently moist earth banks in evergreen forests, deeply shaded, 250–1 400 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, South Africa, Tanzania and Zimbabwe. Also in the temperate and tropical parts of the Old World.

5. ***Adiantum incisum*** Forssk., Flora aegyptico-arabica: CXXV, 187 (1775); Launert: 6.1 (1969); Schelpe: 108 (1970); Schelpe: 85 (1977); Schelpe & Diniz: 107 (1979); Jacobsen: 223 (1983); Schelpe & Anthony: 100 (1986); Burrows: 118 (1990). Type: Yemen, Hâdie, *Forsskål 813* (C!, holo.).

*Adiantum caudatum* sensu Sim: 69 (1892); Sim: 241 (1915).

ILLUSTRATIONS: Fig. 8E & G; Pichi Sermolli: 671, t. 6 (1957).

Terrestrial, epilithic or epiphytic, on seasonally moist earthbanks, in rock crevices, at boulder bases or in riverine forests, 500–1 800 m.

**DISTRIBUTION:** Angola, Botswana, Burundi, Ghana, Kenya, Malawi, Mozambique, Namibia, Nigeria, South Africa, Tanzania, Togo, Uganda, Zambia, Zanzibar and Zimbabwe. Also in the Madagascan region.

6. ***Adiantum lunulatum*** Burm.f., Flora indica: 235 (1768); Sim: 243 (1915). Type: India, Malabar, *Herb. Burmann* [G, lecto., designated by Morton (1974)].

*Adiantum philippense* L.: 1094 (1753), nom. dub., see Verma (1961); Schelpe: 110 (1970); Schelpe: 87 (1977); Schelpe & Diniz: 108 (1979); Jacobsen: 225 (1983); Schelpe & Anthony: 100 (1986); Burrows: 120 (1990). Type: Petiver, *Gazophylacii Naturae Artis et Decas prima* t. 4, fig. 4 (1702). Based on a plant from the Philippine Islands, *sine coll.*

ILLUSTRATION: Pichi Sermolli: 667, t. 4 (1957).

Terrestrial, epilithic or epiphytic, on streambanks in riverine forests, in evergreen forests and in deciduous miombo woodland, 600–1 500 m.

**DISTRIBUTION:** Angola, Benin, Bioko, Burundi, Cameroon, Central African Republic, Chad, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Ghana, Guinea, Guinea Bissau, Liberia, Malawi, Mali, Mozambique, Niger, Nigeria, São Tomé, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Madagascan region and the palaeotropics.

7. ***Adiantum mendoncae*** Alston in Contribuições para o conhecimento da Flora de Moçambique II: 19, t. 6, 7 (1954); Schelpe: 111 (1970); Schelpe & Diniz: 109 (1979); Jacobsen: 226 (1983); Burrows: 120 (1990). Type: Moçambique, Chimoio, fundo da Catarata do Revuê, feto rizomatoso sobre as rochas das margens do rio, 31/10/1944, *F.A. Mendonça 2558* (LISC, holo.; BM, COL, LMA!, iso.).

ILLUSTRATION: Schelpe: t. 36, fig. E (1970).

In light or deep shade on moist earthbanks or epilithic in wet kloof forests.

**DISTRIBUTION:** Mozambique and Zimbabwe.

8. ***Adiantum mettenii*** Kuhn in Jahrbuch des Königlichen Botanischen Gartens und des Botanischen Museums zu Berlin 1: 338 (1881); Schelpe: 86 (1977); Schelpe & Diniz: 108 (1979); Jacobsen: 224 (1983). Type: Angola, *Welwitsch 150* (K, holo.).

ILLUSTRATION: Schelpe: t. 36, fig. F (1970).

Terrestrial, on earthbanks and at boulder bases in moist forests, 600–700 m.

**DISTRIBUTION:** Angola, Democratic Republic of the Congo, Ghana, Mozambique, São Tomé and Tanzania. Also in the Madagascan region and India as far east as the Philippine Islands.

9. ***Adiantum patens*** Willd., Species plantarum 5: 439 (1810). Type: Venezuela, *Bredemeyer s.n.* (B-W 20078, holo.).

*Adiantum oatesii* Baker: 369 (1881b); Sim: 244 (1915); Burrows: 122 (1990). *Adiantum patens* Willd. subsp. *oatesii* (Baker) Schelpe: 203 (1967); Schelpe: 111 (1970); Jacobsen: 227 (1983). Type: Rhodesia, Victoria Falls, *Oates s.n.* (K, holo.).

ILLUSTRATION: Tardieu-Blot: t. 19, fig. 3 (1964a).

Terrestrial, in deep shade in riverine forests and on termite mounds in seasonally moist miombo woodland, 800–1 450 m.

**DISTRIBUTION:** Burundi, Cameroon, Democratic Republic of the Congo, Ghana, Nigeria, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

10. ***Adiantum poiretii*** J.E.Wikstr. in Konglige Svenska Vetenskapsakademiens Handlingar 1825: 443 (1826); Sim: 247 (1915); Schelpe: 112 (1970); Schelpe & Diniz: 111 (1979); Jacobsen: 230 (1983); Schelpe & Anthony: 103 (1986); Burrows: 123 (1990). Type: l'île de Tristan d'Acugna, *Aubert du Petit-Thouars s.n.* (P-JU 1427!, holo.).

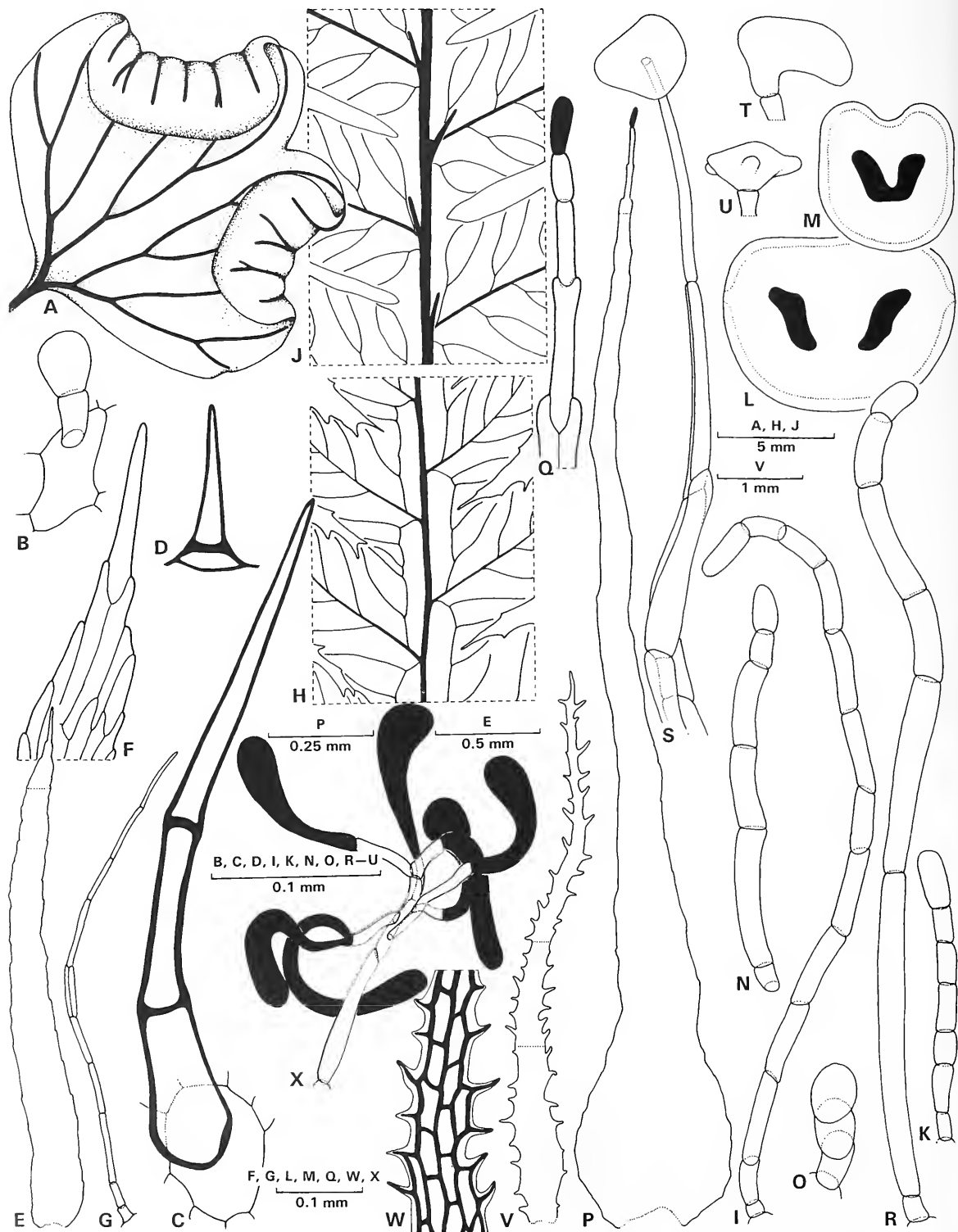


FIGURE 8A–X. Pteridaceae and Vittariaceae. A–R, Pteridaceae, A & B, *Adiantum aethiopicum*, A, fertile segment; B, indusium hair, Roux 2316 (NBG); C & D, A. *hispidulum*, hairs on the adaxial surface of the lamina, Roux 177 (NBG); E–G, A. *incisum*, E, stipe palea; F, apex of E showing the cellular structure; G, stipe hair, Roux 404 (NBG); H & I, *Pteris buchananii*, H, section of the lamina showing the venation; I, paraphyse, Roux 667 (NBG); J & K, *P. catoptera* var. *horridula*, J, section of lamina showing the venation; K, paraphyse, Roux 557 (NBG); L–N, *P. cretica*, L, cross section of the stipe; M, cross section of the rachis; N, stipe hair, Roux 2270 (NBG); O, *P. dentata*, paraphyse, Roux 39 (NBG); P–R, *P. vittata*, P, stipe palea; Q, apex of P showing the cellular structure; R, paraphyse, Roux 1742 (NBG); S–U, *Acrostichum aureum*, S, paraphyse; T & U, variation of the apical cell, Roux 1945 (NBG); V–X, *Vittaria isoetifolia*, V, rhizome palea; W, section of V showing the cellular structure; X, paraphyse, Roux 390 (NBG). Scale bars: A, H, J, 5 mm; V, 1 mm; P, 0.25 mm; E, 0.5 mm; B, C, D, I, K, N, O, R–U, 0.1 mm; F, G, L, M, Q, W, X, 0.1 mm.

*Adiantum sulphureum* Kaulf.: 207 (1824). *Adiantum poiretii* J.E.Wikstr. var. *sulphureum* (Kaulf.) R.M.Tryon: 139 (1957); Schelpe: 113 (1970); Jacobsen: 231 (1983). Type: Habitat in Chile, *Chamisso s.n.* (LE, holo.; P, iso.).

*Adiantum thalictroides* sensu Sim: 72 (1892).

**ILLUSTRATION:** Schelpe & Anthony: t. 30, fig. 2, 2a (1986).

Terrestrial or epilithic, in deeply shaded moist evergreen forests, 200–1 000 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Congo, Democratic Republic of the Congo, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Nigeria, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region, India, the mid-Atlantic islands and Central and South America.

11. **\*Adiantum raddianum** C.Presl, Tentamen pteridographiae: 158 (1836); Schelpe: 113 (1970); Schelpe & Diniz: 112 (1979); Jacobsen: 232 (1983); Schelpe & Anthony: 103 (1986); Burrows: 126 (1990). Type: Raddi, *Plantarum brasiliensium nova genera* 1, t. 78, fig. 2 (1825), icon.

Terrestrial, on moist earthbanks, roadcuttings, streambanks and on forest floors, mostly shaded, 20–1 500 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, Príncipe, São Tomé, South Africa, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region. An introduced species from South America.

12. **Adiantum reniforme** L., *Species plantarum* 2: 1094 (1753). Type: Habitat in Madera, *sine coll. s.n.*, (BM, Herb. Sloane 100: 51, lecto.).

*Adiantum reniforme* L. var. *asarifolium* sensu Sim: 68 (1892); Sim: 240 (1915).

Epilithic, in moist deeply shaded rock crevices, 1 600–1 800 m.

**DISTRIBUTION:** Kenya, Malawi and Tasmania. Also in Madeira.

13. **Adiantum schweinfurtii** Baker, *Diagnoses filicum novarum Socotrensium*: 1 (1882); Schelpe: 86 (1977). Type: Socotra, in montibus Haggier prope Tamarinda, *Balfour 490* (K, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 10 (1953b).

**DISTRIBUTION:** Angola, Central African Republic, Guinea, Mali, Nigeria, Sudan, Tanzania and Togo.

14. **Adiantum vogelii** Mett. ex Keyserl. in *Mémoires de l'Académie Impériale des Sciences de Saint Pétersbourg*. Sér. 7, 22: 8 & 31 (1875); Schelpe: 87 (1977). *Adiantum tetraphyllum* Willd. var. *vogelii* (Mett. ex Keysl.) Bonap.: 105 (1915b). Type: Fernando Po, *Vogel s.n.* (B, holo.; K, iso.).

*Adiantum tetraphyllum* Willd. var. *obtusum* Mett. ex Kuhn: 66 (1868). Type: Ins. Fernando Po, *Vogel s.n.*, *Barter 1458* (K, syn.); *Mann 141* (K, syn.); Congo, Banza, *Smith s.n.* (BM, syn.?).

**ILLUSTRATION:** Tardieu-Blot: t. 6 (1953b).

**DISTRIBUTION:** Angola, Benin, Bioko, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Nigeria, Príncipe, Senegal, Sierra Leone, Togo, Uganda and Zanzibar.

4. Subfamily **Pteridoideae**. Type: *Pteris* L.

*Adiantaceae* Newman subfam. *Pteridoideae* C.Chr. ex Crabbe, Jermy & Mickel: 153 (1975). Type: *Pteris* L.

*Acrostichaceae* Mett. ex A.B.Frank: 1458 (1877). Type: *Acrostichum* L., p.p.

Sporangia are borne on a marginal vascular commissure or on and between anastomosing veins, paraphysate. Spores mostly with an equatorial flange.

#### KEY TO THE GENERA:

Sporangia confined to a continuous or near continuous marginal vascular commissure ..... 0140600 **Pteris**  
Sporangia acrostichoid ..... 0141500 **Acrostichum**

**0140600 PTERIS** L., *Species plantarum* 2: 1073 (1753). Lectotype: *Pteris longifolia* L., designated by J. Smith (1875).

*Pycnodoria* C.Presl: 100 (1851). Type: *Pycnodoria opaca* (J.Sm.) C.Presl; *Pteris opaca* J.Sm.

Plants terrestrial. *Rhizome* solenostelic or dictyostelic, erect to widely creeping. *Fronds* caespitose or widely spaced; stipe with one U-, V- or inverted  $\Omega$ -shaped vascular bundle, adaxially sulcate, often with additional dorso-lateral grooves, often with stout spines; lamina monomorphic, herbaceous to coriaceous, once to several times pinnate, basal pinnae often basiscopically developed, anadromous, upper pinnae gradually to abruptly catadromous, glabrous or hairy; rachis and lower order axes mostly shallowly sulcate, often with stout spines; hypostomatic, stomata mostly of anomo- and polocytic types; aerophores form a continuous dorso-lateral line along the stipe and rachis; venation evident, mostly forked and free but often anastomosing to form costal areoles, ending in or near the margin. *Indumentum* composed of fugaceous paleae occurring on the rhizome and stipe and uniseriate hairs often ending in a small thin-walled cell occurring on various parts of the frond. *Sporangia* on a short or long submarginal vascular commissure, often absent

from the apex and sinus; stalk simple or trichome bearing, 3-seriate below the capsule; capsule with 15–24 indurated annulus cells and a well defined stomium; indusium always present, formed by a modified reflexed margin, elongate to linear; paraphyses absent or short to long, simple, uniseriate. *Spores* tetrahedral or globose, with an equatorial flange, rugate or tuberculate, 30–62 µm in diameter. *Gametophyte*: mature thallus cordate, with distinct midrib and broad wings that become uplifted, glabrous, rhizoids ventrally along the midrib, non-chlorophyllous, with slightly dilated basal region; antheridia first formed, 3-celled, basal cell funnel-shaped, cap cell pushed off during dehiscence; archegonium neck elongated, curved towards the posterior, neck canal cell binucleate, swollen towards the apex; apogamy reported. Chromosome number based on  $2n = 58$ .

A genus of approximately 250 species occurring throughout the tropics and temperate parts of the world. A satisfactory subgeneric classification of the genus has not been proposed. The preliminary system adopted here is that of Tryon *et al.* (1990).

#### KEY TO THE SUBGENERA:

Lamina catadromous; if costae sulcate then the sulci not open to the sulcus of the primary rachis; venation free; spores trilete, the equatorial flange closer to the aperture than to the equator ..... 1 subgen. **Pteris**  
 Lamina anadromous, at least the basal pinnae; axes sulci continuous; veins free or reticulate; spores trilete, flange closer to the equator than to the aperture or wanting ..... 2 subgen. **Litobrochia**

#### 1. Subgenus **Pteris**

#### KEY TO THE SPECIES:

- 1a Upper pinnae simple, the lower pinnae simple or with 1–3 lobes:  
 2a Pinnae all simple ..... 10. **P. vittata**  
 2b Basal pinna pair with 1 or more simple lobes basiscopically ..... 2. **P. cretica**  
 1b Upper pinnae pinnatifid:  
 3a Rachis set with stout spines ..... 5. **P. intricata**  
 3b Rachis without spines:  
 4a Sterile apices of pinna lobes dentate or serrate:  
 5a Basal pair of segments of most pinnae pinnatifid; segments with rounded apices and most somewhat contracted towards the base; pseudo-indusium more or less subcontinuous ..... 9. **P. tremula**  
 5b Basal pair of segments of only the basal pinnae pinnatifid; segments more or less acute and not contracted towards the base; pseudo-indusium wholly continuous ..... 3. **P. dentata**  
 4b Sterile apices of pinna lobes entire or subentire:  
 6a Rhizome creeping with widely spaced fronds ..... 7. **P. repens**  
 6b Rhizome short with tufted fronds:  
 7a Fronds pseudo-palmate ..... 6. **P. muricella**  
 7b Fronds pinnately compound:  
 8a Costular spines absent ..... 4. **P. friesii**  
 8b Costular spines present:  
 9a Stipes reddish ..... 8. **P. togoënsis**  
 9b Stipes castaneous ..... 1. **P. catoptera**

1. **Pteris catoptera** Kunze in Linnaea 18: 119 (1844b). *Pteris quadriaurita* Retz. subsp. *catoptera* (Kunze) Schelpe *sensu* Schelpe: 95 (1977); Schelpe & Diniz: 120 (1979). Type: Ad Portum Natalensem locis humidis umbrosis inter Omfondi et Tagela, 02-04/1842, Gueinzus s.n. (not located).

*Pteris biaurita sensu* Sim: 257, t. 127 (1915).

#### KEY TO THE VARIETIES:

Rachis adaxially without spines ..... 1.1. var. **catoptera**  
 Rachis adaxially with spines ..... 1.2. var. **horridula**

1.1. var. **catoptera**, Schelpe: 118 (1970); Jacobsen: 241 (1983); Schelpe & Anthony: 109 (1986); Burrows: 163 (1990).

**ILLUSTRATION:** Schelpe & Anthony: t. 33, fig. 2, 2a (1986).

Terrestrial, on moist evergreen forest floors, in riverine forests and near waterfalls, lightly to deeply shaded, 20–2 000 m.

**DISTRIBUTION:** Angola, Burundi, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

1.2. var. **horridula** Schelpe in Boletim da Sociedade Broteriana, Sér. 2, 41: 216 (1967); Schelpe: 118 (1970); Jacobsen: 241 (1983); Burrows: 164 (1990). Type: Rhodesia, Umtali District, Inyamatshira Range, 4 600 ft, 29/03/1953, N.C. Chase 4890 (BOL!, holo.; BMI, SRGH!, iso.).

*Pteris quadriaurita sensu* Sim: 108 (1892).

**ILLUSTRATIONS:** Fig. 8J & K; Schelpe: t. 38, fig. 1–3 (1970).

Terrestrial, on moist evergreen forest floors, in riverine forests and near waterfalls, lightly to deeply shaded, 1 400–1 700 m.

**DISTRIBUTION:** Malawi, Mozambique, South Africa and Zimbabwe.

2. **Pteris cretica** L., Systema naturae, 12th edn, 2: 688 (1767b); Sim: 107 (1892); Sim: 253 (1915); Schelpe: 116 (1970); Schelpe: 91

(1977); Schelpe & Diniz: 116 (1979); Jacobsen: 236 (1983); Schelpe & Anthony: 107 (1986); Burrows: 160 (1990). *Pycnodoria cretica* (L.) Small: 91 (1932). Type: Creta, *sine coll. s.n.* (LINN 1246.71, holo.).

*Pteris serraria* Sw.: 65 (1801). Type: Brazil, *Freyreis s.n.* (S, para.).

**ILLUSTRATIONS:** Fig. 8L–N; Schelpe & Anthony: t. 31, fig. 2, 2a (1986).

Terrestrial, in moist evergreen forests and riverine forests and at waterfalls, mostly deeply shaded, 20–1 900 m.

**DISTRIBUTION:** Angola, Burundi, Democratic Republic of the Congo, Kenya, Lesotho, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region, southern Europe, Asia eastwards to Japan.

3. *Pteris dentata* Forssk., *Flora aegyptico-arabica*: CXXIV, 186 (1775); Sim: 255 (1915); Schelpe: 94 (1977); Schelpe & Diniz: 118 (1979); Jacobsen: 239 (1983); Schelpe & Anthony: 109 (1986); Burrows: 160 (1990). Type: Yemen, montium Hadiensium, *Forsskal s.n.* (Lost). Yemen, Menacha, 2 300 m, *Schweinfurth 1402* [C, neo., designated by Runemark (1962)].

*Pteris flabellata* Thunb.: 172 (1800). *Pteris dentata* Forssk. subsp. *flabellata* (Thunb.) Runemark: 190 (1962); Schelpe: 117 (1970). Type: Inter Tafelberg et Leuwkopp, *Thunberg s.n.* [UPS-THUNB 24924!, lecto., designated by Runemark (1962)].

**ILLUSTRATIONS:** Fig. 8O; Schelpe & Anthony: t. 33, fig. 1, 1a (1986).

Terrestrial, in moist evergreen forests, on streambanks and in swamp forests, deeply shaded, 200–1 600 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Kenya, Malawi, Mozambique, Príncipe, Rwanda, São Tomé, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in St Helena and the Madagascan region.

4. *Pteris friesii* Hieron., *Wissenschaftliche Ergebnisse der Schwedischen Rhodesia-Kongo Expedition 1911–1912*, 1: 5, 6 (1914); Schelpe: 118 (1970); Jacobsen: 242 (1983); Schelpe & Anthony: 110 (1986); Burrows: 164 (1990). *Pteris quadriaurita* Retz. subsp. *friesii* (Hieron.) Schelpe: 66 (1969b); Schelpe & Diniz: 120 (1979). Type: Rhodesia bor. orient.: Lunzua river pr. Abercorn, 08/11/1911, *Fries 1220* (UPS!, holo.).

*Pteris abrahamii* Hieron.: 409 (1915). Type: Natal. Bei Mapumulo im Gebiet des Umvoti-Flusses, 1867–1869, S.L. *Abraham 27* (B 51640, holo.).

Terrestrial, in moist evergreen forests, in riverine forests, at waterfalls and in swamp forests, mostly deeply shaded, 800–1 800 m.

**DISTRIBUTION:** Angola, Democratic Republic of the Congo, Malawi, Mozambique, South Africa, Swaziland, Zambia and Zimbabwe.

5. *Pteris intricata* C.H.Wright in *Kew Bulletin* 1906: 252 (1906); Schelpe: 117 (1970); Schelpe: 94 (1977); Schelpe & Diniz: 117 (1979); Jacobsen: 238 (1983). Type: Uganda, Mawakota district, *Brown 158* (K, holo.).

*Pteris adamii* Tardieu: 76 (1953b). Type: Guinée, *Adam 4265* (P, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 23, fig. 1 (1964a).

Terrestrial, in moist, deeply shaded forests, in swamp forests and near waterfalls, 1 000–1 600 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Guinea, Mozambique, Nigeria, Rwanda, Sierra Leone and Zambia.

6. *Pteris muricella* Fée, *Mémoires sur la familles des Fougères* 8: 73 (1857). Type: Mexique, pres de Cordoba et de Huatusco, *W. Schaffner 143* (?P, holo.).

*Pteris pteridioides* (Hook.) Ballard: 348 (1937); Schelpe: 117 (1970); Schelpe & Diniz: 117 (1979); Jacobsen: 237 (1983); Burrows: 163 (1990). *Hypolepis pteroides* Hook.: t. 59 (1861). Type: Peak of Fernando Po, at 7 000 ft, *G. Mann 348* (K, holo.).

*Pteris brevisora* Baker: 162 (1867c); Sim: 258 (1915). Type: Cameroon Mountains and Fernando Po, at an elevation of 4–7 000 ft, *G. Mann s.n.* (missing).

**ILLUSTRATION:** Tardieu-Blot: t. 3, 4 (1953b).

Terrestrial, in moist evergreen forests, deeply shaded, 1 000–2 000 m.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Coté d'Ivoire, Kenya, Liberia, Malawi, Mozambique, Rwanda, São Tomé, Sudan, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region and the neotropics.

7. *Pteris repens* C.Ch., *Index filicum*: 606 (1906). *Afropteris repens* (C.Ch.) Alston: 5 (1956a); nom. nov. for *Pteris nitida* Mett. ex Kuhn: 86 (1868), non R.Br. (1810). Type: Africa occidentalis. Ad flumen Gaboon, *G. Mann 1047* (BM, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 20, fig. 1, 2 (1964b).

**DISTRIBUTION:** Angola, Cameroon, Gabon and Nigeria.

8. *Pteris togoënsis* Hieron. in *Botanische Jahrbücher für Systematik* 53: 402–404 (1915). *Pteris quadriaurita* Retz. subsp. *togoënsis* (Hieron.) Schelpe: 66 (1969b). Type: Togo: in einer Bergschlucht des Ruè-Gebirges in 500 m. ü. M., 08/1908, *Kersting 653* (B, syn.); am Adadia bei Bismarckburg, 13/09/1889, *Kling 250* (B, syn.); im Walde bei Sodó, 27/12/1904, *W. Brusse s.n.* (B, syn.); im Galeriewald

am Takpola bei Ho in 250 m ü. M., 20/02/1904, Schröder 186 (B, syn.).

ILLUSTRATION: Tardieu-Blot: t. 22, fig. 4, 5 (1964a).

DISTRIBUTION: Angola, Guinea, Príncipe and Togo.

9. **\*Pteris tremula** R.Br., Prodomus florae Novae-Hollandiae et insulae Van-Diemen: 154 (1810). Type: SE Australia, NS Wales, Port Jackson 1802–1805, R. Brown s.n. (LD, syn.).

ILLUSTRATION: Runemark: fig. 1B & F (1962).

Terrestrial or epilithic, on moist earthbanks, streambanks and among boulders along streams, exposed or lightly shaded, 200–1 500 m.

DISTRIBUTION: South Africa. An introduced species from New Zealand, Australia and Fiji.

10. **Pteris vittata** L., Species plantarum 2: 1074 (1753); Launert: 4.2 (1969); Schelpe: 115 (1970); Schelpe: 90 (1977); Schelpe & Diniz: 115 (1979); Jacobsen: 235 (1983); Schelpe & Anthony: 105 (1986); Burrows: 158 (1990). *Pycnodoria vittata* (L.) Small: 120, 468 (1938). Type: China, Osbeck s.n. (LINN 1246.3!, holo.).

*Pteris longifolia* sensu Sim: 106 (1892); Sim: 252 (1915).

ILLUSTRATIONS: Fig. 8P–R; Schelpe & Anthony: t. 31, fig. 1 (1986).

Terrestrial or epilithic, on moist forest floors, in riverine forests, swamp forests, and on boulders along rivers and frequently disturbed sites, 50–1 900 m.

DISTRIBUTION: Algeria, Angola, Botswana, Burundi, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, São Tomé, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zanzibar, Zambia and Zimbabwe. Widespread throughout the temperate Old World.

2. Subgenus **Litobrochia** (C.Presl) Hook. Species filicum 2: 207 (1858). *Litobrochia* C.Presl: 148 (1836). Type: *Litobrochia denticulata* (Sw.) C.Presl; *Pteris denticulata* Sw.

#### KEY TO THE SPECIES:

- 1a Upper pinnae simple ..... 3. **P. burtonii**
- 1b Upper pinnae pinnatifid:
  - 2a Veins anastomosing in pinna lobes as well as along the pinna costa:
    - 3a Fronds not proliferous ..... 1. **P. atrovirens**
    - 3b Fronds proliferous:
      - 4a Upper pinnae decurrent on the rachis ..... 3. **P. burtonii**
      - 4b Upper pinnae not decurrent on the rachis ..... 7. **P. similis**
  - 2b Veins anastomosing only along the pinna costa:
    - 5a Fronds 3-pinnate or with the basal pinnae as long or almost as long as the rest of the lamina:
      - 6a Fronds tufted; costal areolea arched ..... 8. **P. tripartita**
      - 6b Fronds widely spaced on a widely creeping rhizome; costal areoles narrow ..... 2. **P. buchananii**
    - 5b Fronds not 3-pinnate:
      - 7a Apices of pinna lobes entire ..... 5. **P. linearis**
      - 7b Apices of pinna lobes crenate or serrate:
        - 8a Stipe and rachis with stout spines ..... 4. **P. hamulosa**
        - 8b Stipe and rachis without spines ..... 6. **P. mildbraedii**

1. **Pteris atrovirens** Willd., Species plantarum, 4th edn, 5: 385 (1810); Schelpe: 93 (1977). Type: Oware et Benin, Flugge s.n. (B-W 19495, holo.).

ILLUSTRATION: Tardieu-Blot: t. 19, fig. 3, 4 (1964b).

Terrestrial, in moist evergreen forests.

DISTRIBUTION: Angola, Benin, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Gabon, Ghana, Guinea, Kenya, Liberia, Nigeria, Pemba, Príncipe, São Tomé, Sierra Leone, Tanzania, Togo and Uganda.

2. **Pteris buchananii** Baker ex Sim, The ferns of South Africa: 111, t. 46 (1892); Sim: 259 (1915); Schelpe: 120 (1970); Jacobsen: 242 (1983); Schelpe & Anthony: 107 (1986); Burrows: 162 (1990). Type: Sunny gorge, top of Inchanga Hill, 01/05/1874, J. Buchanan 196 (K!, holo., 3 sheets).

ILLUSTRATIONS: Fig. 8H & I; Schelpe & Anthony: t. 32, fig. 1, 1a (1986).

Terrestrial, mostly in permanently moist conditions along dry forest margins and streams, generally deeply shaded, 50–1 200 m.

DISTRIBUTION: Malawi, South Africa and Zimbabwe.

3. **Pteris burtonii** Baker in Annals of Botany 5: 218 (1891); Schelpe: 92 (1977). Type: Ghana, Burton s.n. (K, holo.).

**ILLUSTRATION:** Alston: t. 10, fig. A, B (1959).

**DISTRIBUTION:** Angola, Bioko, Burundi, Congo, Côté d'Ivoire, Ghana, Guinea, Nigeria, Príncipe, Sierra Leone and Tanzania.

4. ***Pteris hamulosa*** (Christ) Christ in Annales du Musée du Congo, Botanique, Sér. 5, 3: 30 (1909a); Schelpe: 120 (1970); Schelpe: 94 (1977); Schelpe & Diniz: 121 (1979); Jacobsen: 243 (1983). *Pteris quadriaurita* Retz. var. *hamulosa* Christ: 4 (1908b). Type: Zaire, environs de Kisantu, 1901, J. Gillet s.n. (BR, holo.).

*Pteris acanthoneura* Alston: 15 (1954). Type: Uganda, Budonga in dense forest, Taylor 3337 (BM, holo.).

Terrestrial, on wet deeply shaded forest floors, 50–1 400 m.

**DISTRIBUTION:** Angola, Burundi, Côté d'Ivoire, Democratic Republic of the Congo, Ghana, Mozambique, Nigeria, Pemba, Sudan and Uganda.

5. ***Pteris linearis*** Poir., Encyclopédie méthodique. Botanique 5: 723 (1804). Type: l'île de France, Commerson s.n. (P-LA, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 19, fig. 1, 2 (1964b).

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Côté d'Ivoire, Democratic Republic of the Congo, Ghana, Guinea, Príncipe, São Tomé, Sierra Leone, Tanzania, Zambia and Zimbabwe. Also in the palaeotropics.

6. ***Pteris mildbraedii*** Hieron., in Botanische Jahrbücher für Systematik 53: 415, 416 (1915). Type: Südkameruner Waldgebiet: Bezirk Kribi, an der westlichen Addachung des Randgebirges im Hügellande, 200 m ü. M. bei Fenda, 58 km östlich von Kribi, 07/1911, Mildbraed 5986 (B, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 12, fig. 1 & 6 (1953b).

Terrestrial, on seasonally moist forest floors, lightly shaded, 1 400–1 600 m.

**DISTRIBUTION:** Benin, Bioko, Cameroon, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Nigeria and Zimbabwe.

7. ***Pteris similis*** Kuhn in Cl. v. d. Decken, Reisen in Ost-Afrika in 1851–1861, 3: 21 (1879); Schelpe: 92 (1977). Type: Africa centralis, locis paludosis ad rivulum Assika, Schweinfurth 3311 (BM, isosyn.), ad flumen Mbruole, Schweinfurth 3087 (not located).

*Pteris molunduensis* Hieron.: 417–419 (1915). Type: Südkameruner Waldgebiet: An einem Wasserlauf in *Raphia*-Stumpf im Bezirk und bei der Station Molundu am Dsch Ngoko, 15°12' ö. L. 2°n. Br. bei Nginda, 21 km nördlich Molundu, 04/01/1911, Mildbraed 4164 (B, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 19, fig. 5, 6 (1964b).

**DISTRIBUTION:** Angola, Benin, Bioko, Cameroon, Congo, Côté d'Ivoire, Ghana, Guinea, Nigeria, Príncipe, São Tomé, Sierra Leone, Sudan, Tanzania, Togo and Uganda.

8. ***Pteris tripartita*** Sw. in Journal für die Botanik 1800, 2: 67 (1801); Schelpe: 93 (1977). Type: Java, Thunberg s.n. (UPS-THUNB 24968, 24969, syn.).

*Pteris marginata* Bory: 192 (1804). *Litobrochia marginata* (Bory) C.Presl: 149 (1836). Type: Not located.

**ILLUSTRATION:** Tardieu-Blot: t. 11, fig. 5 (1953a).

**DISTRIBUTION:** Angola, Cameroon, Central African Republic, Côté d'Ivoire, Gabon, Kenya, Príncipe, São Tomé, Tanzania, Uganda and Zanzibar. Also in the Madagascan region, Asia, Australia, Polynesia and the neotropics.

**0141500 ACROSTICHUM** L., Species plantarum 2: 1067 (1753). Lectotype: *Acrostichum aureum* L., designated by Mirbel (1816).

*Chrysodium* Fée: 33, 97 (1845), nom. superfl. Type: *Acrostichum aureum* L.

Plants terrestrial. *Rhizome* dictyostelic, short, creeping to erect, stout; roots fleshy. *Fronde*s approximate; stipe with two larger C-shaped bundles adaxially and a ring of smaller ones abaxially, sulcate; lamina pinnate, with a free conform terminal pinna, glabrous when mature, larger pinnae short-stalked, chartaceous to coriaceous, the basal pinnae anadromous, the upper gradually catadromous; rachis adaxially shallowly sulcate; hypostomatic, stomata of anomo- and polocytic types; venation evident, reticulate, without included veinlets. *Indumentum* mostly composed of broadly attached, entire, proximally multistratose paleae. *Sporangia* acrostichoid, the fertile pinnae apical, stalk simple, 3-seriate below the capsule, capsule with 23–29 indurated annulus cells and a well defined stomium; paraphyses numerous, stalk simple, the apex swollen, lobed. *Spores* tetrahedral-globose, without an equatorial flange, minutely tuberculate, 42–70 µm in diameter. *Gametophyte*: mature thallus cordate, with a distinct median midrib and broad wings; rhizoids ventral along the midrib, with a slightly dilated basal region; antheridium 3-celled, basal cell disk-shaped, dehiscence through a pore in the cap cell before collapsing; archegonia unknown. Chromosome number based on  $2n = 60$  or 120.

A genus of three species mostly occurring in brackish to saline swamps and mangrove vegetation. Pantropical to warm-temperate.

***Acrostichum aureum*** L., Species plantarum 2: 1069 (1753); Sim: 226 (1892); Sim: 292 (1915); Schelpe: 99 (1970); Schelpe: 80 (1977); Schelpe & Diniz: 100 (1979); Jacobsen: 219 (1983); Schelpe & Anthony: 91 (1986); Burrows: 114 (1990). *Chrysodium aureum*

(L.) Mett.: 21 (1856). Type: Icon in Plumier, Description des plantes de l'Amérique: t. 7 (1693), based on a plant from Martinique, designated by Proctor (1985).

Chromosome number:  $2n = 120$  (Roux 1993a).

**ILLUSTRATIONS:** Fig. 8S–U; Schelpe: t. 31, fig. 1 (1970).

Terrestrial halophyte, mostly in coastal mudflats and the upper edges of mangrove swamps, also at inland springs, exposed or lightly shaded, 0–1 400 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Côté d'Ivoire, Gabon, Ghana, Guinea, Guinea Bissau, Kenya, Liberia, Mozambique, Nigeria, Pemba, Príncipe, São Tomé, Sierra Leone, South Africa, Tanzania, Zanzibar and Zimbabwe. Pantropical.

16. **VITTARIACEAE** (C.Presl) Ching in Sunyatsenia 5: 232 (1940a). *Filicaceae* L. tribus *Vittariaeae* C.Presl: 164 (1836), p.p. as '*Vittariaceae*'. *Polypodiaceae* subfam. *Vittarioideae* (C.Presl) C.Chr.: 539 (1938). *Adiantaceae* Newman subfam. *Vittarioideae* (C.Presl) Crabbe, Jermy & Mickel: 154 (1975). Type: *Vittaria* Sm.

Plants epilithic or epiphytic. *Rhizome* solenostelic or dictyostelic, short, decumbent or creeping, dorsiventral; roots with parenchymatous cortical cells. *Fronde* approximate, radial or distichous, monomorphic; stipe poorly defined; lamina simple, narrowly linear or rotund acuminate, costate or ecostate, glabrous or sparsely set with short hairs; hypostomatic, stomata of the polocytic type; venation reticulate forming elongate areoles without included veinlets or the lateral veins pinnately arranged, anastomosing. *Indumentum* composed of 1–3-celled hairs borne on a small epidermal cell occurring adaxially and abaxially on the lamina and clathrate paleae rarely ending in a small thin-walled cell occurring on the rhizome. *Sori* superficial or immersed in a marginal or near marginal line, or elongate along the veins, often forming a reticulate pattern; sporangia borne along a submarginal vascular commissure, short-stalked, 1–2-seriate below the capsule, capsule globose, with 13–18 indurated annulus cells, stomium well defined; exindusiate; receptacle with simple or branched paraphyses ending in a modified indurated terminal cell. *Spores* ellipsoidal, monolet, low papillate, often with scattered spherules and rodlets, to 40–85  $\mu\text{m}$  in diameter. *Gametophyte*: spore germination of the *Vittaria*-type; prothallial development of the *Kaulinia*-type: mature thallus epigeal, with a discontinuous marginal meristem, much branched, branches of indeterminate growth; the aerial branches terminate in gemmae formation, gemmae on short filaments composed of two or more cells; antheridia are primarily produced on germinating gemmae; archegonia are produced on short vertical branches, gametangia are of the advanced leptosporangiate type. Chromosome number based on  $2n = 120$  or 240.

The family Vittariaceae is considered closely related to the Pteridaceae. The chromosome number based on  $2n = 60$  supports this affinity, but the indumentum morphology, paraphyses and the significantly distinct gametophyte morphology separate it from that family. The family has a largely pantropical distribution, but some species extend to temperate regions.

#### KEY TO THE GENERA:

Sporangia along elongate reticulate veins ..... 0144100 **Antrophyum**  
Sporangia embedded in two marginal, submarginal or inframarginal lines ..... 0144300 **Vittaria**

**0144100 ANTROPHYUM** Kaulf., Enumeratio filicum: 197 (1824). Type: *Antrophyum reticulatum* (G.Forst.) Kaulf.; *Hemionitis reticulata* G.Forst.

*Scoliosorus* T.Moore: xxix (1857). Type: *Scoliosorus ensiformis* (Hook.) T.Moore; *Antrophyum ensiforme* Hook.

Plants epilithic or epiphytic. *Rhizome* solenostelic, short, decumbent, dorsiventral. *Fronde* approximate, distichous, monomorphic, stipitate or sessile; stipe terete or poorly defined; lamina simple, entire, ecostate; hypostomatic, stomata are of the polocytic type; venation reticulate, forming elongated areoles, without included veinlets, veins ending in the margin. *Indumentum* composed of 1- to 3-celled hairs borne on a small epidermal cell, occurring adaxially and abaxially on the lamina, and sessile clathrate paleae confined to the rhizome. *Sori* superficial, elongate along the veins, often forming a reticulate pattern; sporangia short-stalked, 2-seriate below the capsule; capsule with 13–17 indurated annulus cells; exindusiate; receptacle with simple paraphyses, ending in a clavate indurated cell. *Spores* monolet or trilete, low-papillate, often with scattered spherules and rodlets, to 60  $\mu\text{m}$  long. Chromosome number based on  $2n = 120$ .

A palaeotropical genus of approximately 20 species best represented in SE Asia.

**Antrophyum mannianum** Hook., A second century of ferns: t. 73 (1861); Schelpe: 96 (1970); Schelpe & Diniz: 98 (1979). *Scoliosorus mannianum* (Hook.) E.H.Crane: 515 (1998). Type: Fernando Po, epiphyte, 3 000 ft above the sea, 1860, G. Mann 367 [K, lecto., designated by Pichi Sermolli (1968a)].

**ILLUSTRATION:** Tardieu-Blot: t. 40, fig. 5 (1953a).

Epiphytic, or epilithic in deeply shaded rock overhangs in moist evergreen forests, 1 200–1 600 m.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Congo, Côté d'Ivoire, Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, Sierra Leone, Tanzania and Uganda.

**0144300 VITTARIA** Sm. in Mémoires de l'Académie des Sciences de Turin 5: 413, t. 9, 5 (1793). Type: *Vittaria lineata* (L.) Sm.; *Pteris lineata* L.

*Haplopteris* C.Presl: 141 (1836). Type: *Haplopteris scolopendrina* (Bory) C.Presl; *Pteris scolopendrina* Bory.

Plants epilithic or epiphytic. *Rhizome* solenostelic or dictyostelic, short-creeping; roots with parenchymatous cortical cells. *Fronde*



approximate, monomorphic; stipe poorly defined; lamina simple, narrowly linear, glabrous, costate; hypostomatic, stomata of the polycytic type; venation pinnately arranged, anastomosing. *Indumentum* composed of clathrate paleae rarely ending in a small thin-walled cell confined to the rhizome. *Sori* immersed in a marginal or near marginal line; sporangia borne along a submarginal vascular commissure, stalk short, 1–2-seriate below capsule, capsule globose, with 13–18 indurated annulus cells, stomium well defined; receptacle with simple or branched (intestinform) paraphyses ending in a modified indurated apical cell. *Spores* ellipsoidal, monolet, 40–85 µm in diameter. *Gametophyte*: mature thallus epigeal, with a discontinuous marginal meristem, much branched, branches of indeterminate growth; aerial branches terminate in gemmae formation, gemmae on short filaments composed of two or more cells; antheridia are produced on primarily germinating gemmae; archegonia are produced on short vertical branches; gametangia are of advanced leptosporangiate type. Chromosome number based on  $2n = 60$  or 240.

A genus of approximately 60 species with a pantropical distribution. Two subgenera are recognized.

#### KEY TO THE SUBGENERA:

- Paraphyses branched (intestinform), the apical cell of the branches clavate ..... 1. subgen. **Vittaria**  
 Paraphyses simple, the apical cell turbinate ..... 2. subgen. **Haplopteris**

#### 1. Subgenus **Vittaria**

**Vittaria isoetifolia** Bory, Voyage dans les quatre principales îles des mers d'Afrique 2: 325 (1804); Sim: 267 (1915); Schelpe: 94 (1970); Schelpe & Diniz: 95 (1979); Jacobsen: 213 (1983); Schelpe & Anthony: 89 (1986); Burrows: 108 (1990). *Oetosis isoetifolia* (Bory) Greene: 106 (1900). Type: Isle de Mascareigne, *Bory de St. Vincent s.n.* (P, holo.; B-W 20026!, iso.).

*Vittaria gueinzii* Trevis.: 167 (1851). Type: South Africa, *Gueinzus s.n.* (K, holo.; S, iso.).

*Vittaria sarmentosa* Ruiz. ex Fée: 17 (1852a). Type: South Africa, *Mundt & Maire, Gueinzus s.n.* (K; S, syn.); *Drège s.n.* (BM; K, syn.).

*Vittaria tenera* Fée: 17, fig. 2, t. 1 (1852a). Type: Port Natal, *Gueinzus s.n.* (K, holo.; S, iso.).

*Vittaria longidentata* Müll.Berol.: 546 (1854). Type: South Africa, *Gueinzus s.n.* (not located).

*Pteropsis angustifolia* Pappe & Raws.: 43 (1858), non Desv. (1827). Type: Between rocks on the mountains near Genadendal, *C.R. Kölbinger s.n.* (SAM!, lecto.), here designated.

*Vittaria lineata* sensu Sim: 216 (1892).

**ILLUSTRATIONS:** Fig. 8V–X; Schelpe: t. 29, fig. B (1970).

Epilithic or epiphytic, deeply shaded moist evergreen forests and protected rock crevices at higher elevations, 50–2 050 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, South Africa, Tanzania and Zimbabwe. Also in the Madagascan region.

*Vittaria vittarioides* (Thouars) C.Chr. from the South Atlantic Islands also belong to subgenus *Vittaria*.

2. Subgenus **Haplopteris** (C.Presl) C.Chr., Index filicum: xlvii (1905). *Haplopteris* C.Presl: 141 (1836). *Vittaria* Sm. sect. *Haplopteris* (C.Presl) Ching: 176 (1931). Type: *Haplopteris scolopendrina* (Bory) C.Presl; *Pteris scolopendrina* Bory (now *Vittaria scolopendrina* (Bory) Thwaites).

#### KEY TO THE SPECIES:

- 1a Sori strictly marginal ..... 1. **V. elongata**  
 1b Sori situated between the margin and the midrib:  
 2a Stipe base green, brown when dry ..... 2. **V. ensiformis**  
 2b Stipe base black:  
 3a Midrib distinctly raised abaxially ..... 4. **V. volkensii**  
 3b Midrib not raised abaxially ..... 3. **V. guineensis**

1. **Vittaria elongata** Sw., Synopsis filicum: 109, 302 (1806); Schelpe: 96 (1970); Schelpe & Diniz: 97 (1979); Jacobsen: 215 (1983); Burrows: 111 (1990). *Oetosis elongata* (Sw.) Greene: 106 (1900). *Haplopteris elongata* (Sw.) E.H.Crane: 514 (1998). Type: India orientali, *J.P. Röttler s.n.* (not located).

*Vittaria stuhlmannii* Hieron.: 421 (1915). Type: Deutsch-Ostafrika: Bei Qilimane, 10/03/1889, *Stuhlmann 1186* (B, holo.).

*Vittaria scolopendrina* sensu Sim: 268 (1915).

**ILLUSTRATION:** Schelpe: t. 29, fig. C1 (1970).

Epiphytic, in moist evergreen coastal forests, 0–50 m.

**DISTRIBUTION:** Kenya, Mozambique, Pemba, Tanzania and Zimbabwe. Also in the Madagascan region, Asia, extending towards Polynesia.

2. **Vittaria ensiformis** Sw. in Gesellschaft naturforschender Freunde zu Berlin, Neue Schriften 2: 134, t. 7, fig. 1 (1799); Burrows: 111 (1990). Type: Mauritius, *Sonnerat s.n.* (P, holo.).

**ILLUSTRATION:** Burrows: t. 24, fig. 111, 111a, b (1990).

Epiphytic, deeply shaded in moist evergreen forests, 350–400 m.

**DISTRIBUTION:** Tanzania and Zimbabwe. Also in Mauritius extending to Malaya.

3. **Vittaria guineensis** Desv. in Magazin für de neuesten Entdeckungen in der gesamten Naturkunde, Gesellschaft naturforschender Freunde zu Berlin 5: 325 (1811); Schelpe: 76 (1977). *Pteris guineensis* (Desv.) Desv.: 293 (1827). *Haplopteris guineensis* (Desv.) E.H.Crane: 514 (1998). Type: Oware, *Palisot de Beauvois s.n.* (P, holo.; B-W 20028 iso.).

**KEY TO THE VARIETIES:**

Rhizome paleae black throughout, 1.5–2 mm long ..... 3.1. var. **guineensis**  
Rhizome paleae clathrate, 3 mm or more long ..... 3.2. var. **orientalis**

3.1. var. **guineensis**

**ILLUSTRATION:** Tardieu-Blot: t. 1, 2 (1953a).

Epilithic or epiphytic, deeply shaded, in moist evergreen forests, 1 000–1 300 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Nigeria, Príncipe, São Tomé, Sierra Leone, Togo and Uganda.

3.2. var. **orientalis** Hieron., in Botanische Jahrbücher für Systematik 53: 426 (1915); Schelpe: 96 (1970); Schelpe & Diniz: 96 (1979); Jacobsen: 215 (1983); Burrows: 110 (1990). Type: Deutsch-Ostafrika: Epiphyt im Urwald auf alten gefallen Baumstämmen bei Shaguin, unweit Station Mbaramu, 15/03/1893, *Holst* 2482 (B; K, syn.); im Bulua-Urwald, ca. 1 030 m ü. M., bei Amani, 15/09/1902, *Holst* 2454 (B; K, syn.); auf einem hohen Baum zwischen Moos im immergrünen Regenwald, 930 m ü. M., bei Amani, 15/09/1902, *Engler* 578 (B, syn.); im Hochwald auf der Insel Kwidjiwi im Kiwu-See, ca. 1 600 m ü. M., 19/09/1907, *Mildbraed* 1236 (B, syn.); im Regenwald auf Bäumen bei Kyimbila am Nordende des Nyassa-Sees, 28/08/1911, *Stolz* 851 (B, syn.).

**ILLUSTRATION:** Burrows: t. 24, fig. 110, 110a, b (1990).

Epilithic or epiphytic, deeply shaded in moist evergreen forests in montane regions, 1 400–2 000 m.

**DISTRIBUTION:** Burundi, Congo, Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zambia and Zimbabwe.

4. **Vittaria volkensii** Hieron., in Botanische Jahrbücher für Systematik 53: 428 (1915); Schelpe: 94 (1970); Schelpe & Diniz: 76 (1979); Jacobsen: 214 (1983); Burrows: 110 (1990). *Haplopteris volkensii* (Hieron.) E.H.Crane: 514 (1998). Type: Deutsch-Ostafrika: An der Landschaft Marangu am Kilimandscharo, im unteren Gürtelwald bei 2 000 m ü. M., von den Bäumen herabhängend, 02/05/1894, *Volkens* 2256 (B, K, P, syn.); an den südlichen Abhängen des Rungwe-Gebirgsstockes im Walde bei 1 900 m ü. M., 14/08/1899, *Goetze* 1168 (B, syn.).

var. **volkensii**

**ILLUSTRATION:** Schelpe: t. 29, fig. A1, 2 (1970).

Epilithic or epiphytic, in moist evergreen forests and at boulder bases near streams in riverine forests, 900–1 500 m.

**DISTRIBUTION:** Congo, Ethiopia, Kenya, Malawi, Mozambique, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

var. **schliebenii** (Reimers) Schelpe is confined to Tanzania.

17. **DICKSONIACEAE** Bower, *Origin of land flora*: 591 (1908), nom. cons. Type: *Dicksonia* L'Hér.

Plants terrestrial. *Caudex* dictyostelic, arborescent, unbranched, densely covered by adventitious roots; roots with a sclerenchymatous inner cortex and a parenchymatous outer cortex. *Fronds* caespitose; stipe with a single C-shaped vascular bundle, adaxially shallowly sulcate; lamina pinnately compound, catadromous, glabrous; rachis adaxially sulcate, the lower order axes dorso-laterally ridged; hypostomatic, stomata mostly of the anomo- and polycytic types; aerophores initially a continuous but later a discontinuous lateral line along the stipe and rachis; venation free, ending in the margin in sterile segments, catadromous. *Indumentum* composed of simple pluricellular uniseriate hairs occurring on the rhizome and frond axes. *Sori* marginal, at the vein endings; sporangium stalk with 4–6 rows of cells, annulus oblique, complete, not interrupted by the stalk; receptacle slightly elevated, paraphysate, paraphyses short, simple uniseriate; indusium: adaxially a slightly differentiated marginal lobe, abaxially with a thinner smaller indusium joined at the base. *Spores* yellow, tetrahedral-globose, trilete, granulate, 44–52 µm in diameter. *Gametophyte*: spore germination of the *Cyathea*-type; prothallial development of the *Adiantum*-type; mature thallus epigeal, chlorophyllous, obcordate, with a central cushion; gametangia borne ventrally; antheridia composed of five or more cells. Chromosome number based on  $2n = 130$ .

A family represented in both the palaeo- and neotropics with fossil records dating back to the Triassic (Cleal 1993). The family is most closely related to the Lophosoriaceae.

**0148100 DICKSONIA** L'Hér., *Sertum anglicum*: 30 (1788), p.p. Type: *Dicksonia arborescens* L'Hér.

Generic description as for the family.

\**Dicksonia antarctica* Labill., Novae Hollandiae plantarum specimen 2: 100, t. 249 (1806). Type: Nova Hollandia et Terra Diemen, Labillardière s.n. (FI 403852, holo.).

ILLUSTRATION: Fig. 9I–K.

Terrestrial, on seasonally moist streambanks in evergreen forests, deeply shaded, 200–300 m.

DISTRIBUTION: South Africa, naturalized on Table Mountain. Native to NE Australia and Fiji.

18. **CYATHEACEAE** Kaulf., Das Wesen der Farrenkräuter: 119 (1827). Type: *Cyathea* Sm.

*Alsophilaceae* C.Presl: 32 (1847). Type: *Alsophila* R.Br.

Plants terrestrial or epilithic. *Caudex* stele radially symmetric forming a complex dictyostele, arborescent, unbranched or rarely with short branches, densely covered by adventitious roots and stipe base scars; roots with a parenchymatous outer cortex and sclerenchymatous inner cortex. *Fronds* caespitose; stipe stele an adaxial and abaxial arch of small vascular bundles, proximally shallowly sulcate adaxially, often bearing spike like epidermal outgrowths; lamina pinnately compound, catadromous; rachis and lower order axes adaxially convex; hypostomatic, stomata of the anomo-, polo- or paracytic types; aerophores laterally or dorso-laterally as pale short interrupted lines along the axes; venation free, catadromous, dichotomously forked, ending near the margin. *Indumentum* composed of contorted hairs and paleae with a fringed edge often ending in a seta, mostly occurring on the frond axes. *Sori* dorsally on the veins before the bifurcation, circular; sporangia with a short 4-seriate stalk; annulus almost vertical, complete, not interrupted by the stalk, stomium well defined; receptacle strongly raised; indusium inferior, attached round the base of the receptacle, with an apical opening or unilaterally attached at the costular side, often with hairs ending in a thin-walled cell along the margin or superficially; receptacle often paraphysate. *Spores* tetrahedral-globose, trilete, 35–56 µm in diameter, mostly 64 per sporangium. *Gametophyte*: spore germination of the *Cyathea*-type; prothallial development of the *Adiantum*-type; mature thallus cordate, long-lived, midrib thin, with multicellular bristle-like hairs on both surfaces along the midrib; gametangia borne together but often only with the archegonia; antheridium wall mostly of 5 cells, basal cell wedge-shaped; archegonium neck with 6–8 tiers of cells, slightly curved, neck canal cell binucleate, often 4-nucleate; apogamy reported. Chromosome number based on  $2n = 138$ .

The family dates from the Cretaceous (Cleal 1993). The origin of gametophytic trichomes in the gleichenioid and cyatheoid ferns is identical (Stokey 1930). Also, the palea morphology of these groups shows some similarities which suggests an affinity with that group.

**0151300** **CYATHEA** Sm. in Mémoires de l'Académie des Sciences de Turin 5: 416 (1793). Lectotype: *Cyathea arborea* (L.) Sm.; *Polypodium arboreum* L., designated by J. Smith (1875).

*Hemitelia* R.Br.: 158 (1810). Type: *Hemitelia multiflora* (Sm.) Spreng.; *Cyathea multiflora* Sm.

Description as for the family. A genus of approximately 600–650 species occurring throughout the tropics with 14 species in Africa (Holttum 1982). Following the proposed classification of Holttum & Edwards (1983) the species on the African subcontinent belong to subgenus *Cyathea* section *Alsophila* (C.Presl) Holttum.

# KEY TO THE SPECIES:

1a Fronds 1-pinnate:

- 2a Lobes of the basal half or more of the largest pinnae separately adnate, the distal ones and all the lobes of the upper pinnae decurrent basiscopically ..... 6. **C. mossambicensis**
- 2b Lobes of the largest pinnae, except a few basal pairs, not separately adnate, all widened almost symmetrically at their bases ..... 1. **C. camerooniana** var. **aethiopica**

1b Fronds 2-pinnate with deeply lobed pinnules:

3a *Indusia* hemitelioid:

- 4a Pinnule lobes acutely serrate; veins simple ..... 2. **C. capensis**
- 4b Pinnule lobes minutely crenate; veins forked ..... 3. **C. deckenii**

3b *Indusia* cyatheoid:

- 5a Stipe bearing black spines 4 mm long; hairs few, mostly distal, abaxially on the costae ..... 5. **C. manniana**
- 5b Stipe not spiny; contorted hairs abundant on the abaxial surface of the costae:
  - 6a Stipe paleae to 15 mm long; pinnules to 50 mm long, lobed to 1 mm from the costa ..... 7. **C. thomsonii**
  - 6b Stipe paleae to 40 mm long, helically twisted distally; pinnules more than 50 mm long, lobed almost to the costa, the basal lobes free ..... 4. **C. dregei**

1. ***Cyathea camerooniana*** Hook., Synopsis filicum: 21 (1865). *Alsophila camerooniana* (Hook.) R.M.Tryon: 30 (1970); Schelpe: 59 (1977). Type: Cameroon Mountains, 900–1 200 m, G. Mann 2059 (K, holo.).

*Cyathea aethiopica* sensu Tardieu: 50 (1953b).

var. **camerooniana** is confined to SE Nigeria, neighbouring Cameroon and Bioko and var. *currorii* Holttum to Principe.

var. **aethiopica** (Welw. ex Hook.) Holttum in Kew Bulletin 36: 480 (1982). *Alsophila aethiopica* Welw. ex Hook.: 44 (1866). *Cyathea aethiopica* (Welw. ex Hook.) Domin: 83 (1930). Type: Angola, Golungo, 1 000–2 400 ft in umbrosis sylv. Primitiv. montium ab Alta Queta, 06/1855, Welwitsch 116 (K, holo.; BM, iso.).

*Alsophila congoensis* Bonap.: 241 (1923b). *Cyathea principis* Domin: 150 (1930), non *C. congoensis* (Hort.) Domin. Type: Congo belge. Walikale-Lubutu. Forêt vierge, 11/01/1915, Bequaert 6562 (P, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 6, fig. 1, 2 (1953b).

Terrestrial, along streambanks in evergreen forests.

**DISTRIBUTION:** Angola, Democratic Republic of the Congo and Equatorial Guinea.

2. **Cyathea capensis** (L.f.) Sm. in Mémoires de l'Académie des Sciences de Turin 5: 417 (1793); Schelpe: 74 (1970); Schelpe & Anthony: 69 (1986); Burrows: 88 (1990). *Polypodium capense* L.f.: 445 (1782). *Hemitelia capensis* (L.f.) Kaulf.: 253 (1824); Sim: 59 (1892); Sim: 85 (1915). *Alsophila capensis* (L.f.) J.Sm.: 666 (1842); Schelpe & Diniz: 74 (1979); Jacobsen: 202 (1983). *Polystichum capense* (L.f.) J.Sm.: 35 (1846). *Cormophyllum capense* (L.f.) Newman: 238 (1854a). *Amphicosmia capensis* (L.f.) Klotzsch: 107 (1856). Type: Habitat ad Cap. bonae spei, *Sparmann s.n.* (LINN 1251.61!, holo.).

*Trichomanes incisum* Thunb.: 173 (1800). Type: Cape Province, Grootvadersbosch, *Thunberg s.n.* (UPS, holo.).

*Cyathea riparia* Willd.: 493 (1810). *Hemitelia riparia* (Willd.) Desv.: 322 (1827). *Amphicosmia riparia* (Willd.) Gardner: 441 (1842b). Type: Cape Province, *Meuron s.n.* (B-W 20172, holo.).

*Trichomanes cormophyllum* Kaulf.: 266 (1824). Type: Habitat in Promontorio bonae spei. (not located).

var. **capensis**

**ILLUSTRATIONS:** Fig. 9A–D; Schelpe & Anthony: t. 19, fig. 1, 1a, b (1986).

Terrestrial or epilithic, mostly in very wet conditions along streams in moist evergreen forests and on moist cliffs in deeply shaded kloofs, 200–1 800 m.

**DISTRIBUTION:** Malawi, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe.

var. **polypodioides** (Sw.) Conant occurs in SE Brazil.

3. **Cyathea deckenii** Kuhn in Cl. v. d. Decken, Reisen Ost-Afrika in 1851–1861, 3: 57 (1879). *Alsophila deckenii* (Kuhn) R.M.Tryon: 30 (1970). Type: In monte Kilimandjaro regionis Dschagga inter 5 500 et 7 800 ped., *vd. Decken & Kersten 72* (B, holo.).

*Cyathea manniana* Hook., p.p. sensu Schelpe (1970).

**ILLUSTRATION:** Schelpe: t. 21, fig. B1–3 (1970).

Terrestrial, in moist evergreen forests, 200–1 500 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Mozambique and Tanzania.

4. **Cyathea dregei** Kunze in Linnaea 10: 551 (1836); Sim: 57 (1892); Sim: 82 (1915); Schelpe: 74 (1970); Schelpe & Anthony: 69 (1986); Burrows: 84 (1990). *Alsophila dregei* (Kunze) R.M.Tryon: 30 (1970); Schelpe: 60 (1977); Schelpe & Diniz: 73 (1979); Jacobsen: 201 (1983). Type: Inter catarractam magnam et Omsamcaba, in valle rupestri umbrosa ad rivulum, 500 p., 1838, *Drège s.n.* [LZt; BM!, lecto., designated by Roux (1986); K!, isolecto.].

*Cyathea burkei* Hook.: 23 (1844). Type: S. Africa, Macalisberg, *Burke s.n.* (K, holo.).

*Cyathea angolensis* Welw. ex Hook.: 22 (1865). Type: Angola, Benguilla, distr. Huila, 3500–5550 ft, among rocks by stream, *Welwitsch 83* (K, holo.).

**ILLUSTRATIONS:** Fig. 9E–H; Schelpe & Anthony: t. 18, fig. 1, 1a (1986).

Terrestrial, in forest margins, on moist streambanks and among boulders and at the base of cliffs in montane grassland, partially shaded or exposed, 50–2 000 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Congo, Democratic Republic of the Congo, Equatorial Guinea, Ghana, Guinea, Lesotho, Malawi, Mozambique, Nigeria, Sierra Leone, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in Madagascar.

5. **Cyathea manniana** Hook., Synopsis filicum: 21 (1865); Schelpe: 72 (1970); Burrows: 87 (1990). *Alsophila manniana* (Hook.) R.M.Tryon: 30 (1970); Schelpe: 61 (1977); Schelpe & Diniz: 73 (1979); Jacobsen: 200 (1983). Type: Fernando Po, 100 m, *G. Mann 363* (K, holo.).

*Cyathea usambarensis* Hieron.: 88 (1895). Type: Usambara, Shagaiuwald bei Mbaramu, *Holst 2498* (B, holo.; K, iso.).

*Cyathea laurentiorum* Christ: 14 (1905b). Type: Zaïre, Marais à Butala, *Laurent s.n.* (BR, holo.).

*Cyathea sellae* Pirota: 173 (1908). Type: Zaïre, Ruwenzori, Vallé Mobuku, *Exp. Ducis Aprutti s.n.* (RO, holo.).

**ILLUSTRATION:** Alston: t. 8, fig. A–K (1959).

Terrestrial, in deep shade on streambanks in forested ravines, 1 500–2 000 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, São Tomé, Sierra Leone, Tanzania, Uganda, Zambia and Zimbabwe.

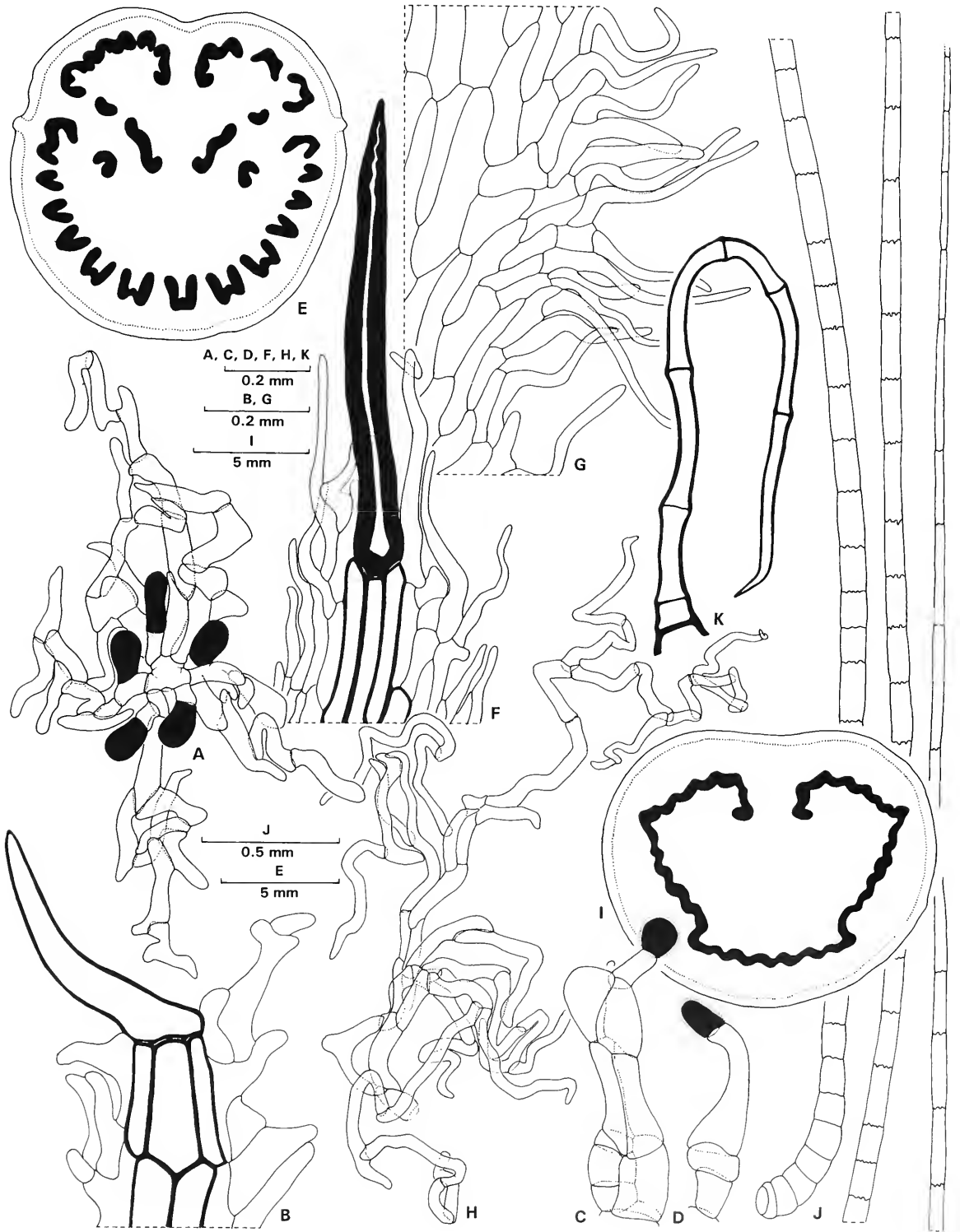


FIGURE 9A–K, Cyatheaaceae and Dicksoniaceae. A–D, *Cyathea capensis*, A, smaller stipe palea; B, apex of the larger stipe palea; C & D, paraphyses, Roux 39 (NBG); E–H, *C. dregei*, E, cross-section of the rachis; F, apex of the larger stipe palea; G, margin of a stipe palea; H, smaller stipe palea, Roux 862 (NBG); I–K *Dicksonia antarctica*, I, cross-section of stipe; J, stipe hair; K, secondary rachis hair, Roux 2935 (NBG). Scale bars: A, C, D, F, H, K, 0.2 mm; B, G, 0.2 mm; I, 5 mm; J, 0.5 mm; E, 5 mm.

6. *Cyathea mossambicensis* Baker in Annals of Botany 5: 185 (1891); Schelpe: 72 (1970); Burrows: 86 (1990). *Alsophila mossambicensis* (Baker) R.M.Tryon: 31 (1970); Schelpe & Diniz: 71 (1979); Jacobsen: 198 (1983). Type: Moçambique, Namuli, *Last s.n.* (K, holo.).

*Cyathea holstii* Hieron.: 88 (1895). *Alsophila campanulata* R.M.Tryon: 30 (1970), nom. nov., non *Alsophila holstii* Hieron. (1895). Type: Usambara, Shagaiuwald bei Mbaramu, *Holst* 2487 (B, holo.; K, iso.).

**ILLUSTRATION:** Schelpe: t. 21, fig. A1, 2 (1970).

Terrestrial, on deeply shaded streambanks in moist evergreen forests, 900–1 500 m.

**DISTRIBUTION:** Malawi, Mozambique, Tanzania and Zimbabwe.

7. *Cyathea thomsonii* Baker in Journal of Botany 19: 180 (1881a); Schelpe: 72 (1970); Burrows: 86 (1990). *Alsophila thomsonii* (Baker) R.M.Tryon: 31 (1970); Schelpe: 59 (1977); Schelpe & Diniz: 72 (1979); Jacobsen: 199 (1983). Type: Lower plateau round Lake Nyassa, *Thomson s.n.* (K, holo.).

*Cyathea zambesiaca* Baker: 121 (1894). Type: Malawi, *Buchanan s.n.* (K, holo.).

**ILLUSTRATION:** Schelpe: t. 21, fig. C1, 2 (1970).

Terrestrial, in deep shade in evergreen wet forests, swamp forests, along streambanks and near waterfalls, 700–1 700 m.

**DISTRIBUTION:** Angola, Democratic Republic of the Congo, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe.

# 19. DENNSTAEDTIACEAE Pic.Serm. in Webbia 24: 704 (1970).

Plants terrestrial. *Rhizome* a polycyclic siphonostele, or with two concentric, much corrugated solenosteles, superficial or subterranean, short and erect, or short- or long-creeping, branched; root cortex parenchymatous throughout or with a sclerenchymatous inner cortex. *Fronds* approximate to distant, monomorphic; stipe and rachis adaxially sulcate, the sulcus not continuous with the sulci of the lower order axes, often with lateral sulci; lamina pinnately compound, intermittently developed in *Hypolepis*, anadromous and/or catadromous; hypostomatic, stomata of the anomo- and polocytic types; aerophores in dorso-lateral lines along the frond axes; venation free or anastomosing, without included veinlets, mostly ending near or in the margin, anadromous and/or catadromous or isodromous. *Indumentum* variable, rhizome indument composed of broadly attached, multistratose, entire paleae (in *Histiopteris*), long unicellular, simple or branched hairs ending in a gnarled apex, simple uniseriate, pluricellular hairs ending in an unmodified or small thin-walled cell, or uniseriate, pluricellular acicular hairs, frond indument composed of multicellular, proximally multistratose, distally uniseriate hairs, simple, uniseriate acicular hairs, simple or branched pluricellular, uniseriate hairs ending in an unmodified or small thin-walled cell, and basi- or dorsifixed unicellular and pluricellular acicular hairs. *Sori* circular, confined to the sinuses, linear or subcircular at the vein endings of the anterior vein branch or marginal; sporangia occurring at a vein ending or along a near marginal vascular commissure, stalk short or long, 3-seriate below the capsule, capsule globose to broadly ellipsoid, with 9–17 indurated annulus cells, stomium well defined; receptacle nude or paraphysate, paraphyses long, simple, multicellular uniseriate hairs, ending in an unmodified apical cell; indusium cup-shaped, a modified lobe margin, a reflexed margin or an well developed outer marginal and partially developed inner indusium, composed of groups of closely spaced acicular hairs. *Spores* tetrahedral-globose and trilete or ellipsoidal and monolete, variously sculptured, 27–70 µm in diameter. *Gametophyte*: spore germination of the *Vittaria*-type; prothallial development of the *Adiantum*-type; mature thallus epigeal, cordate, with a thick central midrib, wings broad and spreading, glabrous, rhizoids confined to the midrib; antheridia mostly on the wings, 3-celled, the basal cell funnel- or barrel-shaped, the cap cell thrown off at dehiscence; archegonia posterior on the midrib, the neck with 4 tiers of cells; neck canal cell binucleate, swollen at the apex. Chromosome number based on  $2n = 76, 86, 96, 104, 172$  and 258.

The Dennstaedtioid ferns, as defined here were first recognized by Alston (1956b), but the affinity of the lindsaeoid ferns, a group here treated as a family of its own, was suggested by Holttum (1947). The Dennstaedtiaceae is a heterogeneous group of plants and is clearly not monophyletic (Pryer *et al.* 1995). The diverse spore sculpture and the varied chromosome numbers occurring in the group support this view. The affinity of the group to the other ferns remains uncertain but Pichi Sermolli (1958a) suggested the Dicksonioid ferns as a possible ancestor.

## KEY TO THE SUBFAMILIES:

Sori terminal on the veins, protected by a cup-shaped indusium ..... 1. subfam. **Dennstaedtioideae**  
 Sori marginal or near marginal, continuous along a marginal vascular commissure, protected by an often strongly modified margin ..... 2. subfam. **Paesioideae**

## 1. Subfamily Dennstaedtioideae

*Dennstaedtiaceae* Pic.Serm. subfam. *Dennstaedtioideae* tribus *Dennstaedtieae* W.-C.Shieh: 193, 194 (1973). Type: *Dennstaedtia* T.Moore

**0152900 MICROLEPIA** C.Presl, Tentamen pteridographiae: 124, 125, t. 4, fig. 21–23 (1836). Lectotype: *Microlepia polypodioides* (Sw.) C.Presl; *Dicksonia polypodioides* Sw. (now *Microlepia speluncae* (L.) T.Moore; *Polypodium speluncae* L.).

Plants terrestrial. *Rhizome* solenostelic, subterranean, long-creeping, branched. *Fronds* approximate to widely spaced, monomorphic; stipe adaxially sulcate; lamina pinnately compound, anadromous; hypostomatic, stomata of the anomo- and polocytic types; venation free, anadromous, the sterile ending in the margin, the fertile ending near the margin. *Indumentum* composed of simple, uniseriate acicular hairs and simple or branched filiform hairs occurring on the rhizome, frond axes and lamina surfaces. *Sori* at the vein endings,

near marginal; indusia cup-shaped, attached at the convex base and margins, directed outwards, superficially with indumentum similar to that occurring on the lamina; sporangia short-stalked, 3-seriate below the capsule, capsule globose, with 13–17 indurated annulus cells and a well defined stomium; paraphyses simple, multicellular, uniseriate hairs, apical cell thin-walled. Spores tetrahedral-globose, trilete, finely echinate, 28–45 µm in diameter. Chromosome number based on  $2n = 86, 172$  and  $258$ .

A genus of approximately 45 species occurring mostly in tropical Asia. Shieh (1973) recognizes two subgenera.

#### KEY TO THE SPECIES:

Veins on the abaxial surface of the pinnules not raised ..... 1. **M. speluncae**  
Veins on the abaxial surface of the pinnules distinctly raised ..... 2. **M. strigosa**

1. **Microlepia speluncae** (L.) T.Moore, Index filicum: 93 (1857); Launert: 3.1 (1969); Schelpe: 89 (1970); Schelpe: 75 (1977); Schelpe & Diniz: 91 (1979); Jacobsen: 210 (1983); Schelpe & Anthony: 85 (1986); Burrows: 106 (1990). *Polypodium speluncae* L.: 1093, 1094 (1753). *Aspidium speluncae* (L.) Willd.: 269 (1810). *Davallia speluncae* (L.) Baker: 100 (1867a); Sim: 63 (1892); Sim: 129 (1915). *Scyphofilix speluncae* (L.) Farw.: 263 (1930). Type: Habitat in Indiis, Hermann s.n. [BM-HERM, vol. 3, fol. 41, lecto., designated by Schelpe & Anthony (1986)].

ILLUSTRATIONS: Fig. 10A–D; Schelpe: t. 27, fig. 1, 2 (1970).

Terrestrial, mostly in permanently moist conditions in semi-deciduous forests, evergreen forests, swamp forests and marshes, generally shaded, 50–1 650 m.

**DISTRIBUTION:** Angola, Botswana, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Namibia, Nigeria, Rwanda, São Tomé, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Madagascan region. Pantropical.

2. **\*Microlepia strigosa** (Thunb.) C.Presl, Epimeliae botanicae: 95 (1851). *Trichomanes strigosum* Thunb.: 339, 340 (1784). Type: Crescit in Kosido, Satsuma et Nagasaki, Thunberg s.n. (UPS-THUNB, holo.).

Terrestrial, along moist streambanks, 1 750 m.

**DISTRIBUTION:** Zimbabwe. Introduced, native to SE Asia and Hawaii.

2. Subfamily **Paesioideae** W.-C.Shieh in Journal of Science and Engineering 10: 202 (1973). Type: *Paesia* A.St.-Hil.

#### KEY TO THE TRIBES:

1a Receptacle paraphysate; rhizome with hairs or multistratose paleae (in *Histiopteris*) ..... 3. tribus **Histiopterideae**  
1b Receptacle not paraphysate; rhizome with hairs only:  
2a Sporangia borne along a marginal vascular commissure, protected by a well differentiated reflexed marginal indusium ..... 1. tribus **Pteridiinae**  
2b Sporangia borne at the end of the anterior vein branches, protected by a differentiated lobe margin ..... 2. tribus **Hypolepideae**

1. Tribus **Pteridiinae** W.-C.Shieh in Journal of Science and Engineering 10: 202 (1973). *Dennstaedtiaceae* Pic.Serm. subfam. *Paesioideae* W.-C.Shieh tribus *Paesioideae* subtrib. *Pteridiinae* W.-C.Shieh: 203 (1973). *Pteridiaceae* Ching: 96 (1975). Type: *Pteridium* Gled. ex Scop.

**0153000 PTERIDIUM** Gled. ex Scop., Flora carniolica: 169 (1760), nom. cons. Type: *Pteridium aquilinum* (L.) Kuhn; *Pteris aquilina* L. *Cincinalis* Gled.: 290 (1764). Type: *Cincinalis aquilina* (L.) Gled. ex Trevis.

*Eupteris* Newman: 278 (1845). Type: *Eupteris aquilina* (L.) Newm.; *Pteris aquilina* L. (now *Pteridium aquilinum* (L.) Kuhn).

Plants terrestrial. Rhizome with two concentric, much corrugated solenosteles, subterranean, long-creeping, branched. Fronds approximate to distant, monomorphic; stipe adaxially sulcate; lamina pinnately compound, anadromous or catadromous, coriaceous, glabrous adaxially; hypostomatic, stomata of the anomocytic type; aerophores in dorso-lateral lines along the frond axes; venation free in sterile fronds. Indumentum composed of long, mostly unicellular hairs ending in a gnarled apex, along the rhizome and stipe base, and basifixed or dorsifixed unicellular and pluricellular acicular hairs abaxially along the axes and lamina surface. Sori marginal; sporangia borne along a marginal vascular commissure, long-stalked, 3-seriate below the capsule, capsule globose, with 12–16 indurated annulus cells, stomium well defined; receptacle not paraphysate; indusium marginal, the outer well developed, fimbriate, the inner indusium partially developed, composed of groups of closely spaced acicular hairs. Spores tetrahedral-globose, trilete, irregularly granulate, 29–39 µm in diameter. Gametophyte: mature thallus cordate, wings broad, glabrous; antheridium 3-celled, basal cell funnel-shaped, cap cell thrown off during dehiscence. Chromosome number based on  $2n = 104$ .

A genus of one cosmopolitan species with two subspecies and a number of varieties.

**Pteridium aquilinum** (L.) Kuhn in Cl. v. d. Decken, Reisen in Ost-Afrika in 1851–1861, 3: 11 (1879). *Pteris aquilina* L.: 1075 (1753); Sim: 113 (1892); Sim: 264 (1915). *Asplenium aquilinum* (L.) Bernh.: 310 (1799). *Allosorus aquilinus* (L.) C.Presl: 153 (1836). *Eupteris aquilina* (L.) Newm.: 278 (1845). *Paesia aquilina* (L.) Keyserl.: 22 (1873). *Cincinalis aquilina* (L.) Gled. ex Trevis.: 239 (1875). *Ornithopteris aquilina* (L.) J.Sm.: 298 (1875). Type: Habitat in Europae sylvis, praesertim caduis. Based on Fuchs, De historia stirpium commenrati insignes t. 596 (1542), icon., designated by Tryon (1941).

## KEY TO THE VARIETIES:

- Basal pinnae about half as long as the lamina; largest pinnule segments deeply pinnatifid; abaxially pubescent to tomentose ..... 1. subsp. **aquilinum**
- Basal pinnae about as long as the lamina; largest pinnule segments pinnatifid; abaxially subglabrous to pubescent ..... 2. subsp. **centrali-africanum**

1. subsp. **aquilinum**, Schelpe: 88 (1970); Schelpe & Diniz: 88 (1979); Jacobsen: 208 (1983); Schelpe & Anthony: 83 (1986); Burrows: 104 (1990).

*Pteris capensis* Thunb.: 172 (1800). *Allosorus capensis* (Thunb.) Pappe & Raws.: 32 (1858), non C. Presl (1836). *Pteridium capense* (Thunb.) Krasser: 6 (1900). *Pteridium aquilinum* (L.) Kuhn subsp. *capense* (Thunb.) C. Chr.: 591 (1906). Type: Promontorio bonae Spei, Thunberg s.n. (UPS-THUNB 24896!, holo., UPS-THUNB 24897!, iso.).

*Pteris coriifolia* Kunze: 120 (1844b). *Allosorus coriifolia* (Kunze) Pappe & Raws.: 31 (1858). Type: Ad promontorio bonae spei, 1841, Gueinzus s.n. (LZ?, holo.).

**ILLUSTRATION:** Fig. 10E–G.

Terrestrial, in seasonally moist open grassveld, along forest margins, and in cultivated fields, exposed or partially shaded, 20–2 000 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Ghana, Guinea, Kenya, Lesotho, Liberia, Malawi, Mozambique, Nigeria, Pemba, Príncipe, São Tomé, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, Zanzibar and Zimbabwe. Also in the Madagascan region and temperate Europe.

2. subsp. **centrali-africanum** Hieron., Wissenschaftliche Ergebnisse der Schwedischen Rhodesia-Kongo Expedition 1911–1912, 1: 7 (1914); Schelpe: 88 (1970); Schelpe: 74 (1977); Schelpe & Diniz: 91 (1979); Jacobsen: 209 (1983); Burrows: 104 (1990). *Pteridium centrali-africanum* (Hieron.) Alston: 22 (1956a). Type: Congo, Stanley Pool, 1888, Hens Serie B, no. 59 [BM, lecto., designated by Tardieu-Blot (1964a); B 121851, isolecto.; Angola, Benguela, Elcude, 15°05' östl. Länge 12°44'südl. Breite, 1 360 m, 1–30/09/1907, F.C. Wellman 1254 (B 121850, syn.); Nordost-Rhodesia: Mokawe ad Bangwedo, in sylvis aridis minus densis, 16/10/1911, Rob.E. Fries 1011 (B 121849, syn.); Deutsch-Ostafrika. Abhänge im unteren Myaka-Tal, 23/01/1901, W. Brusse 944 (B 121852, syn.)].

*Pteridium aquilinum* (L.) Kuhn subsp. *caudatum* (L.) Bonap. var. *africanum* Bonap.: 62 (1915a). *Pteridium aquilinum* (L.) Kuhn var. *africanum* (Bonap.) R.M. Tryon: 51 (1941). Type: Afrique Orientale allemande. Magaba-Thal, Brusse 944 (P, holo.).

**ILLUSTRATIONS:** Fig. 10H; Schelpe: t. 26, fig. 1 (1970).

Terrestrial, in seasonally moist dambos and miombo woodlands, 1 100–2 000 m.

**DISTRIBUTION:** Angola, Democratic Republic of the Congo, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe.

2. Tribus **Hypolepideae** W.-C. Shieh in Journal of Science and Engineering 10: 200 (1973). *Hypolepidaceae* Pic. Serm.: 705, 706 (1970). Type: *Hypolepis* Bernh.

**0153200** **HYPOLEPIS** Bernh. in Neues Journal für die Botanik 1, 2: 34 (1806). Type: *Hypolepis tenuifolia* (G. Forst.) Bernh. ex C. Presl; *Lonchitis tenuifolia* G. Forst.

Plants terrestrial. *Rhizome* solenostelic, subterranean, long-creeping, branched. *Fronds* widely spaced, monomorphic; stipe adaxially sulcate, sulcus not continuous with the sulci of the lower order axes; lamina pinnately compound, intermittently developed, often straggling, anadromous or catadromous; hypostomatic, stomata of the anomo- and polocytic types; venation free, ending near or in the margin. *Indumentum* composed of simple, uniseriate pluricellular acicular eglandular and glandular hairs, the apex of the glandular hairs is composed of a short series of disk-shaped cells, the hairs occur on the rhizome, axes and lamina surfaces, the hairs on the rhizome often end in a small thin-walled cell. *Sori* terminal on the anadromous vein branch; receptacle nude or with simple eglandular hairs several cells long; sporangia long-stalked, simple or with a short multicellular hair at the base, 3-seriate below the capsule, the capsule globose, with 13–(13)–14 indurated annulus cells, the stomium well defined; indusium a modified margin lobe. *Spores* ellipsoidal, monolet, echinate, yellow, 27–52 µm in diameter. *Gametophyte*: mature thallus cordate with a thick central midrib and spreading wings, glabrous; rhizoids confined to midrib; antheridia first formed, mostly on the wings, the basal cell barrel-shaped, the cap cell thrown off at dehiscence; archegonia posterior on the midrib, the neck with 4 tiers of cells; neck canal cell binucleate, swollen at the apex. Chromosome number based on  $2n = 58$ .

A genus of approximately 40 species occurring throughout the tropics and southern temperate areas of the world.

## KEY TO THE SPECIES:

- Lamina with acicular and glandular hairs (rarely also oblong hairs) on the axes, veins and lamina surfaces; receptacle usually with uniseriate hairs ..... 1. **H. villosa-viscida**
- Lamina with acicular and oblong hairs confined to the axes and veins; receptacle nude ..... 2. **H. sparsisora**

1. **Hypolepis villosa-viscida** (Thouars) Tardieu in Flore de Madagascar et des Comores 5, 1: 6, fig. 1, t. 3–5 (1958a). *Polypodium villosa-viscidum* Thouars: 33 (1808). Type: Tristan d'Acunha, Aubert du Petit-Thouars s.n. (P, holo.).

*Polypodium viscidum* Roxb.: 319 (1816). Type: St Helena, Roxburgh s.n. (BM, holo.).



*Cheilanthes viscosa* Carm.: 511 (1818). Type: Tristan da Cunha, *Carmichael s.n.* (K, holo.; BM, iso.).

*Hypolepis helenensis* Fée: 147 (1852b). Type: Habitat in insulâ Sanctae Helenae, *Cuming 433* (not located.).

Terrestrial or epilithic, in permanently moist seepage or boggy places along streams and riverbanks, exposed or lightly shaded, 250–300 m.

**DISTRIBUTION:** South Africa. Also in St Helena and the South Atlantic islands.

2. ***Hypolepis sparsisora*** (Schrad.) Kuhn, *Filices africanae*: 120 (1868); Sim: 236 (1915); Schelpe: 92 (1970); Schelpe & Diniz: 94 (1979); Jacobsen: 211 (1983); Schelpe & Anthony: 87 (1986); Burrows: 106 (1990). *Cheilanthes sparsisora* Schrad.: 918 (1818). *Phegopteris sparsisora* (Schrad.) Keyserl.: 51 (1873). Type: Capplant, *M. Hesse s.n.* (GOET!, holo.).

*Cheilanthes aspera* Kaulf.: 186 (1831). *Hypolepis aspera* (Kaulf.) C.Presl: 162 (1836). Type: In einer Kluft bei dem Wasserfall auf der östlichen Seite des Teufelsberges, -/01/1820, *Ecklon s.n.* (LZ+, holo.; L, iso.).

*Cheilanthes anthriscifolia* Schltdl.: 52 (1832), *quoad spec. Mundt & Maire*, non Willd. (1810). *Hypolepis anthriscifolia* (Schltdl.) C.Presl: 162 (1836); Sim: 76 (1892).

*Cheilanthes commutata* Kunze: 542 (1836). Type: Inter Plettenbergsbaai et Langkloof prope Roodemuur, in valle sylvatica ad rivulum, 500 m, *Drège s.n.* [B!, lecto., designated by Roux (1986); K!, islecto.].

**ILLUSTRATIONS:** Fig. 10I & J; Schelpe: t. 28, fig. 1, 2 (1970).

Terrestrial, in permanently moist conditions along streambank in forests and forest margins, and in seepage areas, exposed or deeply shaded, 50–1 800 m.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, São Tomé, Sierra Leone, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

3. Tribus **Histiopterideae** W.-C.Shieh in *Journal of Science and Engineering* 10: 204 (1973). Type: *Histiopteris* (J.Agardh) J.Sm.

#### KEY TO THE GENERA:

Lamina set with acicular hairs; rhizome bearing acicular hairs ..... 0153300 **Blotiella**  
Lamina glabrous; rhizome bearing simple multistratose paleae ..... 0153400 **Histiopteris**

**0153300 BLOTIELLA** *R.M.Tryon* in *Contributions from the Gray Herbarium, Harvard University* 191: 96 (1962b). Type: *Blotiella glabra* (Bory) R.M.Tryon; *Lonchitis glabra* Bory.

Plants terrestrial. *Rhizome* dictyostelic, short and erect, or short-creeping. *Fronds* approximate, monomorphic; stipe and rachis adaxially sulcate, not continuous with the sulci of the lower order axes; lamina pinnately compound, anadromous or catadromous; hypostomatic, stomata of the eupolocytic type; venation reticulate, ending near the margin, costal and costular areoles elongate, rarely with a free included veinlet, catadromous or isodromous. *Indumentum* composed of long and simple, uniseriate hairs ending in a thin-walled or acicular cell occurring on the rhizome and the stipe base, and simple acicular hairs ending in a small thin-walled cell but mostly in an acicular cell occurring along the frond axes and lamina surfaces. *Sori* circular, confined to the sinuses; sporangia occurring on a C-shaped, near marginal vascular commissure, stalk 3-seriate below the capsule, capsule globose to ovoid, with 10–17 indurated annulus cells, stomium well defined; receptacle paraphysate, paraphyses long and simple, uniseriate, ending in an unmodified apical cell; indusium formed by a reflexed margin, not modified. *Spores* ellipsoidal, monolete, coarsely echinate, 33–70 µm in diameter. Chromosome number based on  $2n = 76$ .

A genus of approximately 12 species occurring in Africa and adjacent islands with one species extending to the Neotropics.

#### KEY TO THE SPECIES:

1a Pinnae near uniformly incised from the apex to the base; rhizome creeping:  
2a Fronds chartaceous; pinna lobes closely spaced, sinuses narrow ..... 1. **B. crenata**  
2b Fronds thinly herbaceous; pinna lobes spaced, sinuses deep and broad ..... 3. **B. glabra**  
1b Pinnae progressively more deeply incised from the apex to the base; rhizome erect:  
3a Rhizome with ferrugineous hairs; sori linear ..... 2. **B. currorii**  
3b Rhizome with pale brown hairs; sori subcircular:  
4a Pinnae short-stalked ..... 4. **B. natalensis**  
4b Pinnae sessile ..... 5. **B. sinuata**

1. ***Blotiella crenata*** (Alston) Schelpe in *Boletim da Sociedade Broteriana*, Sér. 2, 41: 211 (1967); Schelpe: 82 (1970); Schelpe: 66 (1977). *Lonchitis crenata* Alston: 18 (1956a). Type: Belgian Congo: Panzi, *Callens 2920* (BM, holo.).

**ILLUSTRATION:** Schelpe: t. 23, fig. 1, 2 (1970).

**DISTRIBUTION:** Angola, Democratic Republic of the Congo, Tanzania and Zambia.

2. ***Blotiella currorii*** (Hook.) *R.M.Tryon*, *Contributions from the Gray Herbarium, Harvard University* 191: 99 (1962b); Schelpe: 84 (1970); Schelpe: 68 (1977). *Pteris currorii* Hook.: 232 (1858). *Lonchitis currorii* (Hook.) Mett. ex Kuhn: 10 (1879). Type: Angola, near Elephants Bay, *Curror s.n.* (K, syn.).

**ILLUSTRATION:** Tardieu-Blot: t. 13, fig. 1–3 (1964b).

Terrestrial, in moist deeply shaded evergreen forests.

**DISTRIBUTION:** Angola, Benin, Bioko, Burundi, Cameroon, Central African Republic, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Liberia, Mali, Nigeria, Príncipe, São Tomé, Sierra Leone, Sudan, Togo, Uganda and Zambia.

3. **Blotiella glabra** (Bory) R.M.Tryon in Contributions from the Gray Herbarium, Harvard University 191: 99 (1962b); Schelpe: 82 (1970); Schelpe & Diniz: 86 (1979); Jacobsen: 204 (1983); Schelpe & Anthony: 81 (1986); Burrows: 102 (1990). *Lonchitis glabra* Bory: 321 (1804). *Pteris glabra* (Bory) Mett.: 59 (1856). Type: Réunion, *Bory de St. Vincent s.n.* (P, holo.; B-W 20131, iso.).

*Lonchitis stenochlamys* Fée: 142 (1852b). Type: Habitat ad promontorium Bonae Spei, *Drège s.n.* (BM, K, iso.).

*Lonchitis pubescens* sensu Sim: 75 (1892), p.p.; Sim: 261 (1915), p.p., non Willd. ex Kaulf. (1824).

**ILLUSTRATIONS:** Fig. 10P–R; Schelpe & Anthony: t. 21, fig. 2, 2a (1986).

Terrestrial, on moist, deeply shaded forest floors, 200–1 750 m.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Kenya, Malawi, Mozambique, Rwanda, São Tomé, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

4. **Blotiella natalensis** (Hook.) R.M.Tryon in Contributions from the Gray Herbarium, Harvard University 191: 99 (1962b); Schelpe: 82 (1970); Schelpe: 68 (1977); Schelpe & Diniz: 87 (1979); Jacobsen: 205 (1983); Schelpe & Anthony: 81 (1986); Burrows: 100 (1990).

*Lonchitis natalensis* Hook.: 57 (1851). Type: In umbrosis humidis terrae Natalensis, 1845, *Pappe s.n.* (K!, holo.).

*Lonchitis pubescens* sensu Sim: 26 (1915), p.p., non Willd. ex Kaulf. (1824).

**ILLUSTRATION:** Schelpe & Anthony: t. 21, fig. 1 (1986).

Terrestrial, on deeply shaded, wet, evergreen forest floors, 200–1 600 m.

**DISTRIBUTION:** Angola, Burundi, Côté d'Ivoire, Democratic Republic of the Congo, Guinea, Kenya, Malawi, Mozambique, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

5. **Blotiella sinuata** (Alston) Pic.Serm. in Webbia 37: 132 (1983a). *Lonchitis sinuata* Alston: 19 (1956a). Type: Conge Belge, Ealo, J. Lebrun 657 (BM, holo.); Zaire, Yatomela, Carrington F10 (BM, para.).

**DISTRIBUTION:** Democratic Republic of the Congo and Zambia.

**0153400 HISTIOPTERIS** (J.Agardh) J.Sm., Historia filicum: 294 (1875). *Pteris* L. sect. *Histiopteris* J.Agardh: 76 (1839). Type: *Histiopteris vespertilionis* (Labill.) J.Sm.; *Pteris vespertilionis* Labill. (now *Histiopteris incisa* (Thunb.) J.Sm.; *Pteris incisa* Thunb.).

Plants terrestrial or epilithic. *Rhizome* solenostelic, subterranean, widely creeping, branched. *Fronds* widely spaced, monomorphic; stipe and rachis adaxially sulcate, not continuous with the sulci of the lower order axes; lamina pinnately compound, glabrous, catadromous, the basal secondary divisions somewhat stipule-like, touching the rachis; hypostomatic, stomata of the anomo- and polycytic types; aerophores lateral along the stipe, dorso-lateral along the rachis and lower order axes; venation free or anastomosing, without included veinlets, ending in the margin, catadromous. *Indumentum* composed of long simple unicellular hairs and simple, broadly attached multistratose paleae occurring on the rhizome, the stipe base and juvenile fronds, and long multicellular, proximally multistratose, distally uniseriate hairs occurring on the lamina, fugaceous. *Sori* near marginal, linear, occurring along a continuous near marginal vascular commissure; sporangia long-stalked, 3-seriate below the capsule, capsule broadly ellipsoidal, with 13–15 indurated annulus cells and a well defined stomium; receptacle with long, simple, uniseriate, paraphyses; indusium a slightly modified recurved margin containing stomata. *Spores* ellipsoidal, monolete, tuberculate, 33–42 µm in diameter. *Gametophyte*: mature thallus cordate with a thick central midrib and spreading wings, glabrous; rhizoids confined to the midrib; antheridia mostly on the wings, the basal cell barrel-shaped, the cap cell thrown off at dehiscence; archegonia anterior or posterior on the cushion, neck with 4 tiers of cells, curved towards the posterior, neck canal cell binucleate, swollen at the apex. Chromosome number based on  $2n = 96$ .

A monospecific genus occurring in the tropical and south-temperate areas of the world.

**Histiopteris incisa** (Thunb.) J.Sm., Historia filicum: 294 (1875); Sim: 263 (1915); Schelpe: 84 (1970); Schelpe: 70 (1977); Jacobsen: 206 (1983); Schelpe & Anthony: 82 (1986); Burrows: 103 (1990). *Pteris incisa* Thunb.: 171 (1800). *Litobrochia incisa* (Thunb.) C.Presl: 149 (1836). *Phegopteris incisa* (Thunb.) Keyserl.: 51 (1873). Type: e Cap. b. Spei, Grootvadersbosch, *Thunberg s.n.* (UPS-THUNB 249321, holo.; S!, iso.).

**ILLUSTRATIONS:** Fig. 10K–O; Schelpe: t. 24, fig. 1, 2 (1970).

Terrestrial, on permanently or seasonally moist streambanks, forest margins and marshy ground, exposed or lightly shaded, 100–1 800 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Guinea, Kenya, Liberia, Malawi, Príncipe, São Tomé, Sierra Leone, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region. Pantropical.

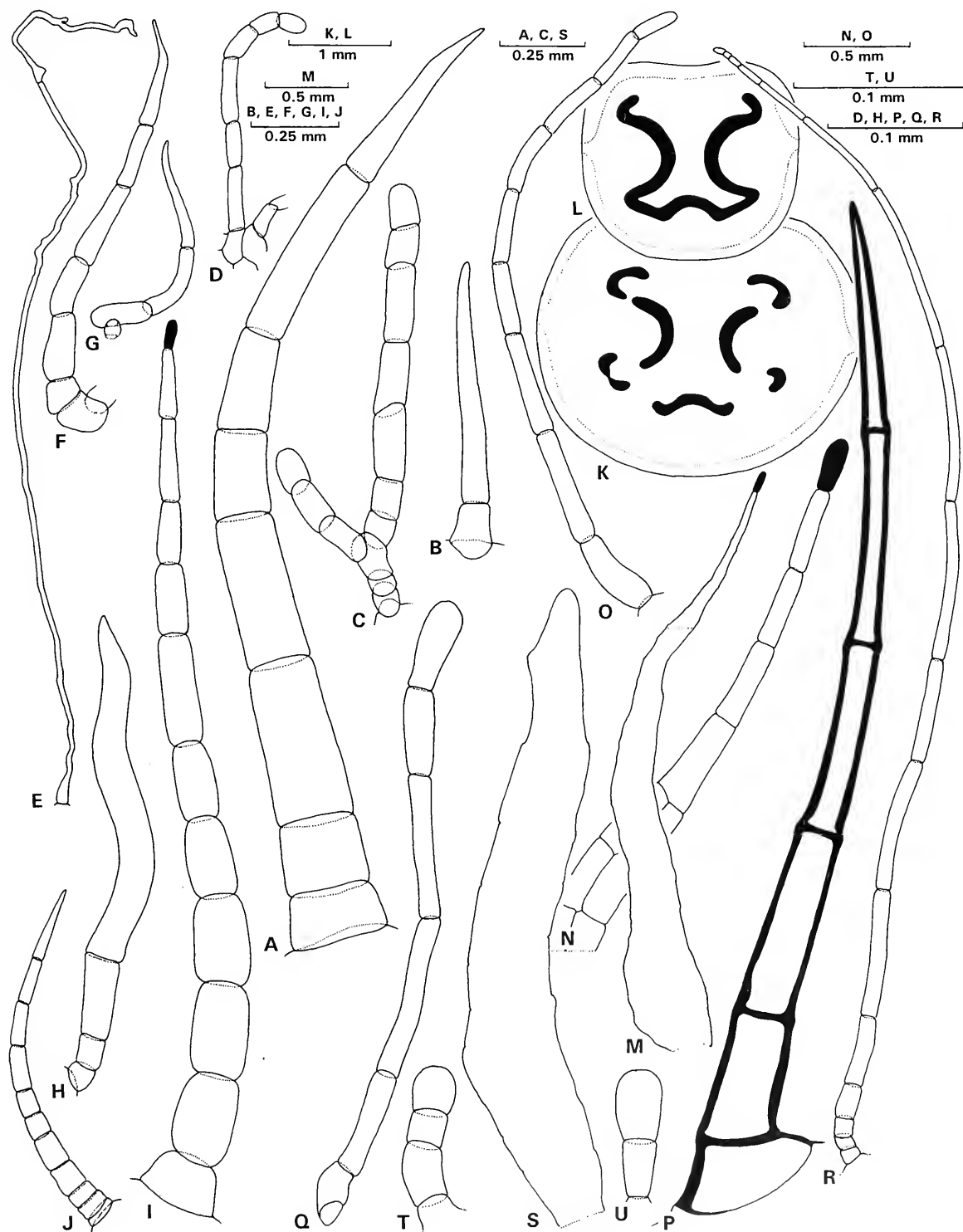


FIGURE 10A–U, Dennstaedtiaceae and Lindsaeaceae. A–D, *Microlepis speluncae*, A–C, lamina hairs; D, paraphyses, Roux 1934 (NBG); E–G, *Pteridium aquilinum* subsp. *aquilinum*, E, stipe base hair; F & G, hairs from the abaxial surface of the lamina, Roux 2349 (NBG); H, *P. aquilinum* subsp. *centrali-africanum*, hair from the abaxial surface of the lamina, Holland s.n. (NBG); I & J, *Hypolepis sparsisora*, I, rhizome hair; J, lamina hair, Roux 34 (NBG); K–O, *Histiopteris incisa*, K, cross section of the stipe; L, cross section of the rachis; M, rhizome palea; N, apex of M showing the cellular structure; O, paraphyse, Roux 2630 (NBG); P–R, *Blotiella glabra*, P, hair from the adaxial surface of the lamina; Q & R, stipe hairs, Roux 1923 (NBG); S–U, *Lindsaea ensifolia*, S, rhizome palea; T & U, paraphyses, Kluge 2523 (NBG). Scale bars: K, L, 1 mm; M, 0.5 mm; B, E, F, G, I, J, 0.25 mm; A, C, S, 0.25 mm; N, O, 0.5 mm; T, U, 0.1 mm; D, H, P, Q, R, 0.1 mm.

20. **LINDSAEACEAE** *Pic.Serm.* in *Webbia* 24: 707 (1970). *Lindsaeae* Hook.: 202 (1846), as tribus. *Dennstaedtiaceae* *Pic.Serm.* subfam. *Lindsaeoideae* (*Pic.Serm.*) Crabbe, Jermy & Mickel: 155 (1975). Type: *Lindsaea* Dryand. ex Sm.

Plants terrestrial or epilithic. *Rhizome* protostelic with internal phloem, or solenostelic, short creeping; roots with a sclerenchymatous cortex and an inner thin-walled cell layer composed of six large cells. *Fron*ds approximate, monomorphic; stipe and rachis adaxially sulcate, not continuous with the sulci of the lower order axes; lamina pinnately compound, anadromous and/or catadromous; venation free or anastomosing, without included veinlets, anadromous; hypostomatic, stomata of the anomo- and polocytic types. *Indumentum* composed of entire multistratose paleae that often terminate in a small thin-walled cell, or acicular hairs occurring on the rhizome, the axes and lamina surfaces glabrous or with acicular hairs similar to those occurring on the rhizome. *Sori* linear, near marginal or marginal; sporangia on a submarginal vascular commisure, stalk short or long, 3-seriate below the capsule, capsule globose to broadly ellipsoid, with 9–22 indurated annulus cells, stomium well defined; receptacle with short, simple, uniseriate paraphyses; indusium elongate, a modified margin opening towards the margin. *Spores* tetrahedral-globose and trilete or ellipsoidal and monolete, smooth or granulate, 35–63 µm in diameter. *Gametophyte*: mature thallus cordate, with a thin median midrib and spreading wings, glabrous; rhizoids restricted to the midrib; antheridium 3-celled, the cap cell collapses during dehiscence; archegonia unknown. Chromosome number based on *n* = 50.

The family Lindsaeaceae is generally considered closely related to the Dennstaedtiaceae and is often included in the latter as a subfamily (Crabbe *et al.* 1975) or as a tribe (Tryon & Tryon 1982b). This may be ascribed to the sharing of primitive characters by these groups. More recent studies showed that the lindsaeoid ferns have a closer affinity to the pteridioid ferns than with the Dennstaedtioid ferns (Wolf 1995).

KEY TO THE GENERA:

- 1a Lamina set with acicular hairs; rhizome solenostelic ..... 0153500 **Lonchitis**
- 1b Lamina glabrous; rhizome protostelic:
  - 2a Sori occur on the distal lamina margins ..... 0153600 **Odontosoria**
  - 2b Sori occur along the lateral lamina margins ..... 0153900 **Lindsaea**

**0153500 LONCHITIS** *L.*, *Species plantarum* 2: 1078 (1753). Lectotype: *Lonchitis hirsuta* *L.*, designated by Brongniart (1826).

*Anisosorus* Trevis. ex Maxon: 429 (1926), nom. superfl. Type: *Lonchitis hirsuta* *L.*

Plants terrestrial. *Rhizome* solenostelic, short-creeping. *Fron*ds approximate, monomorphic; stipe and rachis adaxially sulcate, with lateral sulci in larger plants, the primary sulcus not continuous with the sulci of the lower order axes; lamina pinnately compound, anadromous and/or catadromous; hypostomatic, stomata of the polocytic type; venation catadromous, free or irregularly anastomosing, without included veinlets. *Indumentum* composed of simple, uniseriate, acicular hairs occurring on the rhizome, frond axes and lamina surfaces. *Sori* occur on a submarginal vascular commisure joining several veins; indusium a modified lamina margin; receptacle with simple, filiform, uniseriate paraphyses. *Spores* globose, trilete, granulate, 40–55 µm in diameter. Chromosome number based on *n* = 50.

A genus of two species, *Lonchitis hirsuta* *L.* occurring in tropical America and *L. occidentalis* in Africa and the Madagascan region.

**Lonchitis occidentalis** *Baker*, *Synopsis filicum*: 128 (1867b); Schelpe: 86 (1970); Schelpe: 72 (1977). *Anisosorus occidentalis* (Baker) C.Chr.: 54 (1932a). Type: Angola, Cuanza Norte, Golungo Alto, Sobado de Quilombo, Quiacatubia, *Welwitsch* 132 [K, lecto., designated by Schelpe (1977); BM, LISU, isolecto.).

*Lonchitis friesii* Brause: 6, 7 (1914). Type: Nordost-Rhodesia: am Lunzua-Fluss nahe Abercorn, an schattigem Standort in der Nähe von einem Wasserfall, 08/11/1911, *R.E. Fries* 1221 (UPS, holo.).

**ILLUSTRATION:** Schelpe: t. 25, fig. 1, 2 (1970).

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Democratic Republic of the Congo, Ghana, Guinea, Nigeria, São Tomé, Sierra Leone, Tanzania, Uganda and Zambia. Also in the Madagascan region.

**0153600 ODONTOSORIA** (*C.Presl*) *Fée*, *Mémoires sur la familles des fougères* 5: 325 (1852b). *Davallia* *J.Sm.* sect. *Odontosoria* *C.Presl*: 129 (1836). Type: *Odontosoria uncinella* (Kunze) *Fée*; *Davallia uncinella* Kunze.

*Sphenomeris* Maxon: 144 (1913b), nom. cons. Type: *Sphenomeris clavata* (*L.*) Maxon; *Adiantum clavatum* *L.* (now *Odontosoria clavata* (*L.*) *J.Sm.*).

Plants terrestrial. *Rhizome* protostelic, short creeping. *Fron*ds approximate; lamina pinnately compound; venation free, ending near the margin. *Sori* marginal, terminal on a vein; sporangium stalk slender, capsule with 18–22 indurated annulus cells; indusium attached at the base and the greater part of the sides; receptacle paraphysate. *Spores* globose, trilete, granulate, 35–63 µm in diameter. *Gametophyte*: mature thallus cordate, with a thin median midrib and spreading wings, glabrous; rhizoids restricted to the midrib; antheridium 3-celled, cap cell collapses during dehiscence; archegonia unknown. Chromosome number unknown.

A genus of approximately 22 species with a pantropical distribution.

**Odontosoria afra** (*K.U.Kramer*) *J.PRoux*, *comb. nov.* *Sphenomeris afra* *K.U.Kramer*: 353, fig. 1 (1971); Schelpe: 112 (1977). Type: Angola, Minungo, Xá-Sengue, *Young* 1118 (BM, holo.; U, iso.).

**ILLUSTRATION:** Verdcourt: fig. 9, t. 1–4 (2000).

**DISTRIBUTION:** Angola, Congo, Democratic Republic of the Congo, Malawi, São Tomé and Tanzania.

**0153900 LINDSAEA** *Dryand. ex Sm.* in Mémoires de l'Académie des Sciences de Turin 5: 413, fig. 4, t. 9 (1793). Lectotype: *Lindsaea trapeziformis* Dryand. (now *Lindsaea lancea* (L.) Bedd.; *Adiantum lancea* L.).

Plants terrestrial or epilithic. *Rhizome* protostelic, creeping, branched. *Fronds* approximate, monomorphic; stipe and rachis adaxially shallowly sulcate, the lower order axes not sulcate; lamina pinnately compound, glabrous; hypostomatic, stomata of the anomo- and polocytic types; venation reticulate, without included veinlets, ending near the margin, anadromous. *Indumentum* composed of entire multistratose paleae often ending in a small thin-walled cell occurring on the rhizome. *Sori* linear, near marginal; sporangia borne along a near marginal vascular commissure; short-stalked, 3-seriate below the capsule; capsule broadly elliptic, with 9–12 indurated annulus cells, stomium well defined; receptacle with short uniseriate paraphyses; indusium elongate, opening towards the margin. *Spores* tetrahedral-globose, trilete, 20–65 µm in diameter. *Gametophyte*: mature thallus cordate, with a thin median midrib and spreading wings, glabrous; rhizoids restricted to the midrib; antheridium 3-celled, cap cell collapses during dehiscence; archegonia unknown. Chromosome number based on  $2n = c. 174$  or  $310$ .

A genus of approximately 150 species with a pantropical distribution. Two subgenera are recognized. Subgenus *Lindsaea* is characterized by terrestrial species with a radial stele, whereas subgenus *Odontoloma* is characterized by epiphytic species with a dorsiventral stele.

#### Subgenus **Lindsaea**

A subgenus divided into several sections of which two occur on the African subcontinent.

#### KEY TO THE SECTIONS:

Lamina without a conform terminal pinna; venation reticulate ..... 1. sect. **Schizoloma**  
Lamina with a conform terminal pinna; venation free ..... 2. sect. **Osmolindsaea**

1. Section **Schizoloma** (*Gaudich.*) *K.U.Kramer* in Acta Botanica Neerlandica 15: 571 (1967). *Schizoloma* *Gaudich.*: 507 (1824). *Lindsaea* *Dryand. ex Sm.* subgen. *Schizoloma* (*Gaudich.*) *Hook.*: 219 (1846). Type: *Schizoloma cordatum* *Gaudich.*

**Lindsaea ensifolia** *Sw.* in Journal für die Botanik 1800, 2: 77 (1801); *Sim*: 67 (1892); *Schelp*: 139 (1970); *Schelp & Diniz*: 141 (1979); *Jacobsen*: 294 (1983); *Schelp & Anthony*: 151 (1986); *Burrows*: 182 (1990). *Schizoloma ensifolium* (*Sw.*) *J.Sm.*: 414 (1841a); *Sim*: 130 (1915). *Schizolegnia ensifolia* (*Sw.*) *Alston*: 24 (1956a). Type: *Ins. Mauritii, sine coll. s.n.* (S!, holo.).

*Lindsaea membranacea* *Kunze*: 121 (1844b). Type: *Ad pedem arborum excelsiorum prope Natalensis, 12/1841, Gueinzus s.n.* (B, ?holo.; BM, BR, HBG, L, P, W, iso.).

#### subsp. **ensifolia**

**ILLUSTRATIONS:** Fig. 10S–U; *Schelp*: t. 43, fig. 1, 2 (1970).

Terrestrial, in deep shade in permanently moist coastal lagoon forests and streams in kloofs, 20–100 m.

**DISTRIBUTION:** Bioko, Cameroon, Gabon, Ghana, Guinea, Mozambique, Nigeria, Pemba, South Africa, Tanzania and Zimbabwe. Also in the Madagascan region.

subsp. **coriacea** (*Alderw.*) *K.U.Kramer* occurs in West and Central Malaysia.

2. Section **Osmolindsaea** *K.U.Kramer* in Blumea 15: 560 (1968). Type: *Lindsaea odorata* *Roxb.*

**Lindsaea odorata** *Roxb.* in Calcutta Journal of Natural History 4: 511 (1844); *Schelp*: 139 (1970); *Schelp & Diniz*: 142 (1979); *Jacobsen*: 295 (1983); *Burrows*: 182 (1990). Type: *Roxburgh's plate [K, lecto., in the absence of a specimen, designated by Kramer (1972)]*.

**ILLUSTRATION:** *Schelp & Diniz*: t. 11, fig. 1–3 (1979).

Terrestrial or epilithic, streambanks or moist evergreen forests, exposed or lightly shaded, 350–400 m.

**DISTRIBUTION:** Mozambique and Zimbabwe. Also in tropical East Asia

21. **POLYPODIACEAE** *Bercht. & J.Presl*, O Prirozenosti Rostlin, aneb Rostlinar 1: 272 (1820). Type: *Polypodium* L.

Plants terrestrial, epilithic or epiphytic. *Rhizome* dictyostelic, dorsiventral, dorsally with two rows of proximally or widely spaced phyllopodia or frond scars, short- or long-creeping, laterally branched; roots formed ventrally, cortex sclerenchymatous, inner cortex with passage cells. *Fronds* mono-, hemi- or dimorphic, articulated or not; stipe short or long, terete or adaxially shallowly sulcate; lamina simple, unequally lobed or pinnatifid, entire or shallowly crenate; hypostomatic, stomata of the dia-, peri-, polo-, copolo- and cyclocytic types; venation free or anastomosing, anadromous or catadromous, with or without simple or forked free included excurrent and/or recurrent veinlets, often areole layered, often ending in a hydathode. *Indumentum* composed of basifixed, short-stalked, pseudo-peltate, peltate or filamentous paleae, clathrate or not, often bearing unicellular thin-walled cells along the margin or rarely with superficial filiform trichomes near the point of attachment, the apex always ending in a small thin-walled cell, occurring on the rhizome, axes and lamina surfaces, with sessile to short-stalked stellate hairs occurring on the lamina surfaces (in *Platyserium*

and *Pyrrosia*) or with simple clavate or branched hairs on the lamina surfaces. *Sori* circular, oval, linear or in a soral patch, superficial or slightly sunken, then embossed, scattered or in a single row on either side of the primary or secondary vein, positioned at the apex of the acroscopic vein branch, at a vein plexus or on a soral vein; sporangium stalk short or long, simple, 3-seriate below the capsule; capsule globose, with 12–21 indurated annulus cells and a well defined stomium; exindusiate; receptacle nude, with simple pluricellular hairs, stellate hairs or with peltate clathrate paleae. *Spores* mostly 64, ellipsoidal, monolete or trilete, smooth, granulate, rugate, rugose or tuberculate, 43–95 µm long. *Gametophyte*: spore germination of the *Gleichenia*- or *Vittaria*-type; prothallial development of the *Drynaria*-type; mature thallus cordate with a thin median midrib and broad wings, or ribbon-shaped with spreading wings, often branched and clone forming, rhizoids mostly ventrally along the midrib, glabrous or superficially and marginally with unicellular, papillate, secretory hairs and superficially also with multicellular glandular hairs bearing unicellular papillate branches on stalk cells; antheridium 3-celled, subglobose, the basal cell short, funnel-shaped, dehiscence by a pore in the cap cell or the collapse of the cap cell; archegonium with a short or slender neck, 3–5 tiers high, curved towards the posterior, neck canal cell binucleate, swollen towards the apex; vegetative reproduction by unicellular marginal gemmae (in *Loxogramme*). Chromosome number based on  $2n = 70, 72$  or  $74$ .

Holtum (1947) and Pichi Sermolli (1958a) support a dipteroid ancestor for the family. The chromosome number, largely based on  $2n = 74$  supports an affinity with the Grammitidaceae, a family often included in the Polypodiaceae (Copeland 1947; Tryon & Tryon 1982b). Polypodiaceae has a near cosmopolitan distribution with the greatest diversity in tropical areas, especially in Asia. Few genera occurring in the Old World also occur in the New World.

#### KEY TO THE SUBFAMILIES:

- Lamina indumentum composed of stellate hairs ..... 1. subfam. **Platyserioideae**  
 Lamina indumentum various but never with stellate hairs ..... 2. subfam. **Polypodioideae**

1. Subfamily **Platyserioideae** Nayar in Taxon 19: 223 (1970). *Platyseriaceae* (Nayar) Ching: 18 (1978a). Type: *Platyserium* Desv.

#### KEY TO THE GENERA:

- Fronds dimorphic, differentiated into sterile, non-articulated basal fronds and articulated fertile fronds ..... 0155100 **Platyserium**  
 Fronds monomorphic, all articulated ..... 0155200 **Pyrrosia**

**0155100 PLATYSERIUM** Desv. in Mémoires de la Société Linnéenne de Paris 6: 213 (1827); Hennipman & Roos (1982). Lectotype: *Platyserium alcornae* Sw., nom. illeg., non P.Willemet (1976), (now *P. alcornae* Desv.), designated by J. Smith (1875).

Plants epiphytic. *Rhizome* dictyostelic, short-creeping. *Fronds* dimorphic, approximate, base fronds sessile, non-articulated, always sterile, base entire and clasping the substratum, the upper parts variously shaped and incised, fertile fronds articulated, usually dichotomously forked, ending in oblong lobes; hypostomatic, stomata mostly of the polocytic type; venation anastomosing, with included veinlets. *Indumentum* composed of narrow, centrally multistratose paleae, marginally and superficially closely set with simple trichomes ending in an obtuse cell or an acicular cell, or branched and composed of two types occurring on the rhizome, and sessile to short-stalked stellate hairs with 7–14 rays occurring on the lamina surfaces. *Sporangia* crowded in acrostichoid patches situated at the lobe sinuses, short-stalked, simple, 3-seriate below the capsule, capsule globose, with 16–18 indurated annulus cells and a well defined stomium; indusium absent; paraphyses long-stalked, stellate. *Spores* yellow, ellipsoidal, monolete, tuberculate. *Gametophyte*: mature thallus cordate with a thin median midrib and broad wings, rhizoids mostly ventrally along the midrib, superficially and marginally with unicellular, papillate, secretory hairs and superficially also with multicellular glandular hairs bearing unicellular papillate branches on the stalk cells; antheridium subglobose, the basal cell short, dehiscence by a pore in the cap cell; archegonium with slender neck, neck canal cell binucleate, swollen towards the apex. Chromosome number based on  $2n = 74$ .

A pantropical genus of 15 species most diversified in Asia where eight species occur.

#### KEY TO THE SPECIES:

- 1a Foliage fronds broadly cuneate, entire ..... 2. **P. elephantotis**  
 1b Foliage fronds dichotomously divided:  
   2a Foliage fronds 1–2 times dichotomously forked; soral patches 2 per frond ..... 3. **P. stemaria**  
   2b Foliage fronds 2–3 times dichotomously forked; soral patches generally 4 or 8 per frond ..... 1. **P. alcornae**

1. **Platyserium alcornae** Desv. in Mémoires de la Société Linnéenne de Paris 6: 213 (1827); Schelpe: 145 (1970); Schelpe & Diniz: 148 (1977); Hennipman & Roos: 79 (1982); Jacobsen: 301 (1983); Burrows: 188 (1990). *Acrostichum alcornae* Sw.: 11, 12 (1801), non P.Willemet (1976). Type: Johanna Isl., Comores, *Herb. Sloane* vol. 102, fol. 194 (BM, holo.).

*Acrostichum alcornae* P.Willemet: 61 (1976). Type: Madagascar, *Stadtman s.n.* (missing).

*Platyserium vassei* Poisson: 530 (1910). Type: Mozambique, from live material, *Vasse s.n.*

*Platyserium bifurcatum* sensu Sim: 293 (1915).

**ILLUSTRATION:** Schelpe: frontispiece (1970).

High-level epiphyte, in seasonally dry forests and woodlands, exposed or partially shaded, 20–400 m.

**DISTRIBUTION:** Kenya, Mozambique, Tanzania and Zimbabwe. Also in the Madagascan region.

2. **Platyserium elephantotis** Schweinf. in Botanische Zeitung (Berlin) 29: 361, fig. c (1878); Schelpe: 145 (1970); Schelpe: 113 (1977); Schelpe & Diniz: 147 (1979); Hennipman & Roos: 95 (1982); Jacobsen: 300 (1983). Type: Central Africa, Sudan (Niamniam), Mando's village, *Schweinfurth 3120* (K, iso; B, drawing).

*Platynerium angolense* Welw. ex Baker: 425 (1868b), nom. illeg.; Sim: 294 (1915). *Alcicornium angolense* Welw. ex Underw.: 593 (1905). Type: Angola, Golungo Distr., *Welwitsch 160* (K, holo.; BM, iso).

**ILLUSTRATIONS:** Fig. 11A–F; Schelpe: frontispiece (1970).

High-level epiphyte or epilithic, in seasonally dry forests and forest edges, exposed or partially shaded, 100–1 200 m.

**DISTRIBUTION:** Angola, Benin, Burundi, Cameroon, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, Sudan, Tanzania, Togo, Uganda and Zambia.

3. ***Platynerium stemaria*** (P.Beauv.) Desv. in Mémoires de la Société Linnéenne de Paris 6: 213 (1827); Schelpe: 114 (1977); Hennipman & Roos: 108 (1982). *Acrostichum stemaria* P.Beauv. 1: 2, t. 2 (1803). Type: Oware, *Palisot de Beauvois s.n.* (P-JU 1008, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 53, fig. 1–3 (1964a).

**DISTRIBUTION:** Angola, Benin, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Liberia, Nigeria, Príncipe, São Tomé, Senegal, Sierra Leone, Sudan, Togo and Uganda.

**0155200 PYRROSIA** Mirb., Histoire naturelle des végétaux, classés par familles 4: 70 (1803a). Type: *Pyrrosia chinensis* Mirb. (now *Pyrrosia stigmata* (Sw.) Ching; *Polypodium stigosum* Sw.).

Plants epilithic or epiphytic. *Rhizome* dictyostelic, creeping, laterally branched, dorsally with two rows of short, approximate to widely spaced phyllopodia arranged in two rows. *Fronds* monomorphic, articulated; stipe short; lamina simple, entire; hypostomatic, stomata mostly of the pericytic type; venation anastomosing, with simple and forked included veinlets. *Indumentum* composed of narrow pseudo-peltate or peltate paleae with short marginal projections occurring on the rhizome, and short- to long-stalked stellate hairs occurring on the stipe and lamina surfaces. *Sori* circular to slightly elongate, dorsally or terminally on included veins; sporangia short-stalked, simple, 3-seriate below the capsule; capsule globose, with 13–21 indurated annulus cells and a well defined stoma; exindusiate; receptacle with paraphyses not differentiated from the lamina indument. *Spores* ellipsoidal, monolet, granulate, 54–95 µm long. *Gametophyte*: mature thallus cordate with a thin median midrib and broad wings, rhizoids mostly ventral along the midrib, superficially and marginally with unicellular, papillate, secretory hairs and superficially also with multicellular glandular hairs bearing unicellular papillate branches on the stalk cells; antheridium subglobose, the basal cell usually short, dehiscence by a pore in the cap cell; archegonium with a slender neck, the neck canal cell binucleate, swollen towards the apex. Chromosome number based on  $2n = 74$ .

A genus of approximately 51 species confined to the palaeotropics.

#### KEY TO THE SPECIES:

- 1a Stellate hairs on the lamina dimorphic ..... 5. ***P. stolzii***
- 1b Stellate hairs on the lamina monomorphic:
  - 2a Stellate hairs with long thin brownish arms:
    - 3a Rhizome paleae entire to subentire; sori scattered over most of the lamina ..... 3. ***P. rhodesiana***
    - 3b Rhizome paleae lacerate; sori confined to the distal 1/2 to 1/3 of the lamina ..... 1. ***P. africana***
  - 2b Stellate hairs with short flat white arms:
    - 4a Rhizome paleae ciliate; fronds widely spaced on a slender rhizome ..... 2. ***P. lanceolata***
    - 4b Rhizome paleae not ciliate; fronds closely spaced ..... 4. ***P. schimperiana***

1. ***Pyrrosia africana*** (Kunze) F.Ballard in Kew Bulletin: 349 (1937); Jacobsen: 303 (1983); Schelpe & Anthony: 155 (1986); Hovenkamp: 151 (1986); Burrows: 192 (1990). *Niphobolus africanus* Kunze: 501 (1836). *Niphobolus africanus* Kunze var. *major* Kunze: 501 (1836), nom. illeg. *Gyrosorium africanum* (Kunze) C.Presl: 140 (1851). *Polypodium africanum* (Kunze) Mett.: 131 (1857), non Desv. (1827); Sim: 203 (1892). *Cyclophorus africanus* C.Chr.: 197 (1905); Sim: 283 (1915). Type: Prope missionis coloniam inter Omgaziana et Omtata in praerupto rupestri, alt. 250 ped., *Drège s.n.* [BM, lecto., designated by Roux (1986); B, L, P, WAG, isolecto.].

*Niphobolus africanus* Kunze var. *minor* Kunze: 501 (1836). Type: Prope missionis coloniam inter Omgaziana et Omtata, ad truncos arborum, 1838, *Drège s.n.* [BM!, lecto., designated by Roux (1986); B, L, P, WAG, isolecto.].

**ILLUSTRATIONS:** Fig. 11G; Hovenkamp: t. 30 (1986).

Epilithic or epiphytic, in moist or seasonally moist evergreen, (mostly) coastal forests, partially or densely shaded, 20–700 m.

**DISTRIBUTION:** South Africa.

2. ***Pyrrosia lanceolata*** (L.) Farwell in American Midland Naturalist 12: 245 (1930) as '*Pyrrhosia lanceolatus*'; Schelpe: 146 (1970); Schelpe & Diniz: 149 (1979); Jacobsen: 305 (1983); Hovenkamp: 191 (1986); Burrows: 189 (1990). *Acrostichum lanceolatum* L.: 1067 (1753). *Cyclophorus lanceolatus* (L.) Alston: 102 (1931a). Type: Habitat in India, *Herb. Hermann I, fol. 3* (BM, holo.; L, iso.).

**ILLUSTRATION:** Burrows: t. 191, 191a (1990).

Epiphytic, in seasonally moist semi-deciduous woodlands, mostly below 700 m.

**DISTRIBUTION:** Cameroon, Central African Republic, Congo, Gabon, Malawi, Mozambique, Príncipe, São Tomé, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region, palaeotropical.

3. ***Pyrrosia rhodesiana*** (C.Chr.) Schelpe in Journal of South African Botany 18: 126 (1952); Schelpe: 147 (1970); Schelpe & Diniz: 151

(1979); Jacobsen: 304 (1983); Hovenkamp: 235 (1986); Burrows: 191 (1990). *Cyclophorus rhodesianus* C.Ch.: 161 (1932b). Type: S. Rhodesia, 17/02/1926, F. Eyles 4472 (K, holo.; BOLL, iso.).

ILLUSTRATIONS: Fig. 11H; Burrows: t. 193, 193a (1990).

Epilithic or epiphytic, in wet montane forests, mostly deeply shaded, 800–1 650 m.

DISTRIBUTION: Malawi, Mozambique, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

4. *Pyrrosia schimperiana* (Mett. ex Kuhn) Alston in Journal of Botany 72, Suppl.: 8 (1934); Schelpe: 147 (1970); Schelpe: 114 (1977); Schelpe & Diniz: 150 (1979); Jacobsen: 304 (1983); Schelpe & Anthony: 155 (1986); Hovenkamp: 241 (1986); Burrows: 190 (1990). *Polypodium schimperianum* Mett. ex Kuhn: 152 (1868). *Niphobolus schimperianus* Giesenh. ex Diels: 325 (1899). *Cyclophorus schimperianus* C.Ch.: 200 (1905). Type: Abyssinia, Dscha-Dshe, *Schimper* 1441 (B!, holo.; BR, P, iso.).

*Cyclophorus mechowii* Brause & Hieron ex Hieron.: 395 (1911). *Niphobolus mechowii* (Brause & Hieron.) Brause & Hieron.: 55 (1908), nom. nud. *Pyrrosia schimperiana* (Mett. ex Kuhn) Alston var. *mechowii* (Brause & Hieron.) Schelpe: 129 (1952). *Pyrrosia mechowii* (Brause & Hieron.) Alston: 37 (1954). Type: Angola: bei Pungo Andongo, 01/1879 – 04/1879, *Theusz* 32 [B, lecto., designated by Schelpe (1952) sensu Hovenkamp (1986)].

var. *schimperiana*

ILLUSTRATION: Schelpe: t. 45, fig. A1, 2 (1970).

Epilithic or epiphytic, poikilohydrous in seasonally moist swamp forests, riverine forests and kloof forests, moderately to deeply shaded, 400–1 200 m.

DISTRIBUTION: Angola, Burundi, Cameroon, Central African Republic, Democratic Republic of the Congo, Ethiopia, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

var. *liebushii* (Hieron.) Hovenkamp is confined to Tanzania and differs from the typical variety in the very narrow fronds.

5. *Pyrrosia stolzii* (Hieron. ex Engl.) Schelpe in Journal of South African Botany 18: 33 (1952); Schelpe: 147 (1970); Hovenkamp: 255 (1986). *Niphobolus stolzii* Hieron. ex Engl.: 55 (1908). *Cyclophorus stolzii* (Hieron. ex Engl.) Hieron.: 396 (1911). Type: Deutsch-Ostafrika: auf Bäumen im feuchten schattigen Walde, auch in der Steppe in 1 450 m Höhe ü. M. im Kondeland, Nyassagebiet, 07/1899, *Stolz* 96 (B, holo.; P, iso.).

Epiphytic, in rainforests and cloudforests, moderately to deeply shaded, 1 450–2 100 m.

DISTRIBUTION: Malawi, Tanzania and Zambia.

2. Subfamily **Polypodioidae** Nayar in Taxon 19: 234 (1970). Type: *Polypodium* L.

#### KEY TO THE TRIBES:

- 1a Fronds strongly dimorphic, non-articulated ..... 1. tribus **Drynariaceae**
- 1b Fronds hemi- or monomorphic, articulated at the stipe base:
  - 2a Sori linear, at an acute angle to the primary vein ..... 4. tribus **Loxogrammeae**
  - 2b Sori circular, oval or linear, scattered or arranged in one or two rows on either side of primary vein, if linear then apical and parallel to the primary vein:
    - 3a Venation free or reticulate, if reticulate then the areoles mostly without included veinlets ..... 3. tribus **Polypodiaceae**
    - 3b Venation reticulate, most areoles with simple or forked excurrent and/or recurrent included veinlets ..... 2. tribus **Microsoreae**

1. Tribus **Drynariaceae** S.Chandra in Fern Gazette 12: 226 (1982). *Polypodiaceae* Bercht. & J.Presl subfam. *Drynarioideae* Crabbe, Jermy & Mickel: 156 (1975). *Drynariaceae* Ching: 19, 20 (1978b). Type: *Drynaria* (Bory) J.Sm.

**0158300 DRYNARIA** (Bory) J.Sm. in Journal of Botany (Hooker) 4: 60 (1841b), nom. cons.; Roos: 215 (1985). *Polypodium* L. subgen. *Drynaria* Bory: 464 (1825). Type: *Drynaria quercifolia* (L.) J.Sm.; *Polypodium quercifolium* L., typ. cons.

Plants epiphytic, epilithic or (rarely) terrestrial. *Rhizome* dictyostelic, creeping, without phyllopodia. *Fronds* dimorphic, with sterile base fronds and fertile foliage fronds, non-articulated, approximate to widely spaced; base fronds sessile, lobate; foliage fronds pinnatifid; stipe narrowly winged, sulcate; pinnules articulated along the stipe; rachis shallowly sulcate adaxially, not open to the sulci of the costae; hypostomatic, stomata mostly of the polocytic type; venation anastomosing, with simple and branched included veinlets. *Indumentum* composed of basifixed or peltate paleae with elongate marginal protuberances and uni- and bicellular glandular cells along the margin occurring on the rhizome, and filiform, basifixed or peltate paleae on the lamina as well as uni- or bicellular glandular trichomes occurring on the lamina. *Sori* circular, in a single row parallel to the primary vein on the branching points of more than four veins; sporangium stalk slender, simple, 3-seriate below the capsule; capsule globose, with 13–16 indurated annulus cells and a well defined stomium; exindusiate; receptacular hairs simple or branched with one or two glandular cells and complex receptacular paleae. *Spores* ellipsoidal, monolete, smooth or verrucate. *Gametophyte*: mature thallus cordate, large, with a thick midrib and spreading wings, rhizoids restricted to the midrib, sparsely set superficially and along the margin with unicellular, papillate secretory hairs and superficially with clavate, multicellular glandular hairs bearing unicellular papillate cells on branched stalk cells; antheridium 3-celled, the basal cell funnel-shaped, dehiscence by the collapse of the cap cell; archegonium neck short, curved



towards the posterior, the neck canal cell binucleate, with a swollen apex. Chromosome number based on  $2n = 72$  or  $74$ .

A genus of 16 species occurring in Africa, throughout Asia to NE Australia.

#### KEY TO THE SPECIES:

- Rhizome scales dull, peltate ..... 1. **D. laurentii**  
Rhizome scales glossy, basifixed ..... 2. **D. volkensii**

1. **Drynaria laurentii** (Christ ex DeWild. & T.Durand.) Hieron., Die Vegetation der Erde 9: 57, fig. 54 (1908); Schelpe: 115 (1977); Roos: 226 (1985). *Polypodium propinquum* Wall. ex Mett. var. *laurentii* Christ ex DeWild. & T.Durand: 70 (1899). Type: Zaïre, Bas-Congo, Inkisi, *Laurent s.n.* [BR, lecto., designated by Roos (1985)].

*Polypodium propinquum* Wall. ex Mett. var. *intermedium* DeWild.: 6 (1908). Type: Bas-Congo (région de Kisantu), 1901, *J. Gillet 1864* (BR, holo.); Madiata, 1901 et vallée de la Nsele, *J. Gillet 2225 & 2282* (BR, para.).

Chromosome number:  $2n = 74$  (Löve, Löve & Pichi Sermolli 1977).

ILLUSTRATION: Hieronymus: fig. 54 (1908).

Terrestrial or epilithic, forms large clumps in moist evergreen forests, exposed or partially shaded, 1 800–2 150 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Central African Republic, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Nigeria, Príncipe, Rwanda, São Tomé, Sierra Leone, Tanzania, Togo and Uganda

2. **Drynaria volkensii** Hieron., Die Vegetation der Erde 9: 57 (1908). Type: Tanzania, Kilimanjaro, *Volkens 735* (B, holo.; K, iso.).

*Drynaria volkensii* Hieron. var. *macrospora* Hieron.: 394 (1911). Type: Deutsch-Ostafrika: bei Ninagongo unweit Kissenge, 1 800–2 000 m Höhe ü. M., 01/10/1907, *Mildbraed 1288* (B, holo.).

ILLUSTRATION: Schelpe: t. 46, fig. 1–4 (1970).

Epilithic or epiphytic in evergreen montane forests, 1 700–2 180 m.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Rwanda, Ethiopia, Kenya, Malawi, Mozambique and Uganda,

2. Tribus **Microsoreae** V.G.Tu in Novosti Sistematiki vysshikh I nizshikh Rastenii 18: 18 (1981). *Polypodiaceae* Bercht. & J.Presl subfam. *Microsorioideae* Nayar 19: 233, 234 (1970). Type: *Microsorium* Link.

#### KEY TO THE GENERA:

- 1a Apical fertile part of the lamina contracted to form a spike; sporangia coenosporioid ..... 0159200 **Belvisia**  
1b Apical fertile part of the lamina not contracted; sporangia borne in large circular or oval sori:  
2a Receptacle with peltate, clathrate paraphyses ..... 0160100 **Lepisorus**  
2b Receptacle with simple or rarely branched uniseriate hair-like paraphyses ..... 0161600 **Microsorium**

**0159200 BELVISIA** Mirb., Histoire naturelle, générale et particulière, des plantes 4: 65 (1803a); Hovenkamp & Franken: 517 (1993). Lectotype: *Belvisia spicata* (L.f.) Mirb. ex Copel.; *Acrostichum spicatum* L.f., designated by Becherer (1936).

*Hymenolepis* Kaulf.: 146 (1824), nom. illeg., non Cassini (1817). Type: *Hymenolepis ophioglossoides* Kaulf. (now *Belvisia spicata* (L.f.) Mirb. ex Copel.).

Plants epilithic or epiphytic. *Rhizome* dictyostelic, short-creeping, dorsally with two rows of fronds. *Fronds* dimorphic, articulated, approximate; stipe short, partially winged distally, adaxially shallowly sulcate; lamina simple, entire; hypostomatic, stomata mostly of the polocytic type; venation anastomosing, secondary veins prominent, areoles irregular, with branched included veinlets in costal and marginal areoles, all directed to the costa, veinlets in other areoles predominantly directed to the costa. *Indumentum* composed of clathrate, pseudo-peltate paleae, the margins near entire or with 1- or 2-celled glandular marginal projections occurring on the rhizome paleae. *Sori* borne on either side of the primary vein of a linear, contracted apical segment, acrostichoid; sporangium stalk simple, 3-seriate below the capsule, capsule globose, with 12–16 indurated annulus cells and a well defined stomium; exindusiate; receptacle with glandular hairs and basifixed or peltate paleae. *Spores* ellipsoidal, monolete, rugose, 40–90 µm long. *Gametophyte*: mature thallus cordate, broader than long, midrib thin and the wings spreading, rhizoids restricted to the midrib, superficially and marginally with unicellular, papillate, secretory hairs and superficially with clavate, multicellular glandular hairs; antheridium 3-celled, globose, basal cell funnel-shaped, dehiscence by the collapse of the cap cell; archegonium neck short, curved towards the posterior, the neck canal cell binucleate, the apex swollen at maturity. Chromosome number based on  $2n = 70$ .

A genus of approximately 10 species occurring in the tropics and warm temperate areas of the Old World. *Belvisia* is considered closely related to *Lepisorus*, but is distinguished mainly by the coenosori.

**Belvisia spicata** (L.f.) Mirb. ex Copel., Genera filicum: 192 (1947); Schelpe: 159 (1970); Schelpe & Diniz: 163 (1979); Jacobsen: 319 (1983); Burrows: 202 (1990); Hovenkamp & Franken: 524 (1993). *Acrostichum spicatum* L.f.: 444, 445 (1782). *Hymenolepis spicata* (L.f.) C.Presl: 159 (1851). Type: Habitat in Isle de France, *Commerson s.n.* (P, holo.).

ILLUSTRATION: Tardieu-Blot: t. 54, fig. 1 (1964a).

Epilithic or epiphytic, in moist evergreen forests, moderately to deeply shaded, 900–1 950 m.

**DISTRIBUTION:** Bioko, Cameroon, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Gabon, Malawi, Mozambique, São Tomé, South Africa, Tanzania and Zimbabwe. Also in the Madagascan region, Asia, the Pacific and Australia.

**0160100 LEPISORUS** (*J.Sm.*) Ching in Bulletin of the Fan Memorial Institute of Biology 4: 47 (1933b). *Drynaria* (Bory) J.Sm. sect. *Lepisorus* J.Sm.: 13 (1846). Type: *Lepisorus thunbergianus* (Kaulf.) Ching; *Pleopeltis thunbergiana* Kaulf.

Plants epilithic or epiphytic. *Rhizome* dictyostelic, creeping, laterally branched, with short, closely to widely spaced phyllopodia dorsally. *Fronds* monomorphic, articulated; stipe short or estipitate, adaxially convex or shallowly sulcate, distally narrowly winged; lamina simple, entire; hypostomatic, stomata mostly of the polo- and copolocytic types; venation anastomosing, with simple and branched included excurrent and recurrent veinlets ending in a hydathode; secondary veins anadromous and/or catadromous. *Indumentum* composed of 2–4-celled, clavate hairs, apical cell appears glandular, the stalk simple or with 1 (rarely 2) clavate, glandular trichomes occurring adaxially and/or abaxially on the lamina and with narrow basifixed or peltate clathrate paleae ending in a small oblong thin-walled cell on the rhizome, axes and abaxial lamina surface. *Sori* circular, large, medial, in a single row parallel, and on both sides of the costa on the distal part of the lamina; sporangium long-stalked, simple, 3-seriate below the capsule, capsule ellipsoidal, with 12–16 indurated annulus cells and a well defined stomium; exindusiate; receptacular paleae clathrate, peltate, long-stalked, with a single, often branched glandular cell along the margin. *Spores* ellipsoidal, monolete, rugate, 43–80 µm long. *Gametophyte*: mature thallus with a strap-shaped posterior and a cordate anterior, midrib thin and wings spreading, rhizoids restricted to the midrib, superficially and marginally with unicellular, papillate, secretory hairs and superficially with clavate, multicellular glandular hairs; antheridium globose, the basal cell funnel-shaped, dehiscence by the collapse of the cap cell; archegonium neck short, curved towards the posterior, the neck canal cell binucleate, the apex swollen at maturity. Chromosome number based on  $2n = 70$ .

A genus of approximately 25 species confined to the palaeotropics, also in Hawaii.

#### KEY TO THE SPECIES:

Fronds membranous, deciduous; rhizome paleae concolorous ..... 1. **L. excavatus**  
Fronds coriaceous, persistent; rhizome paleae with a prominent black central region ..... 2. **L. schraderi**

1. **Lepisorus excavatus** (Bory ex Willd.) Ching in Bulletin of the Fan Memorial Institute of Biology 4: 68 (1933b). *Polypodium excavatum* Bory ex Willd.: 158 (1810). *Phymatodes excavata* (Bory ex Willd.) C.Presl: 196 (1836). *Drynaria excavata* (Bory ex Willd.) Fée: 270 (1852b). *Pleopeltis excavata* (Bory ex Willd.) Sledge: 138 (1960); Schelpe: 151 (1970); Schelpe: 118 (1977); Schelpe & Diniz: 155 (1979); Jacobsen: 307 (1983); Schelpe & Anthony: 161 (1986); Burrows: 198 (1990). Type: Habitat in insulae Mauriti et Borboniae arboribus, *Bory de St. Vincent* s.n. (B-W 19619/2, lecto., designated by Schelpe & Anthony (1986); B-W, Pl, PE, isolecto.).

*Polypodium stolzii* Hieron.: 389 (1911). *Lepisorus stolzii* (Hieron.) Pic.Serm.: 33 (1947). *Pleopeltis stolzii* (Hieron.) Pic.Serm.: 189 (1968a). Type: Deutsch-Ostafrika: bei Lungue im Kondeland, Nyassagebiet in Höhe von 1 459 m ü. M., 02/07/1899, *Stolz 96b* [B, lecto., designated by Pichi Sermolli (1968a); BM, P, isolecto.]; Oberes Kongogebiet: am Berge Tenga (Runsoro-orde Ruwinzoro-Gebirge, 15/05/1908, *Kassner 2968* (B, K, P, Z, isosyn.).

*Polypodium lineare* sensu Sim: 197 (1892); Sim: 275 (1915).

**ILLUSTRATION:** Burrows: t. 45, fig. 200, 200a (1990).

Epilithic or epiphytic, in dry forests, mist-forests and seasonally or permanently moist evergreen forests, partially or deeply shaded, 1 000–2 400 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Cameroon, Coté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, São Tomé, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region, the Himalayas, Southern India and Japan.

2. **Lepisorus schraderi** (Mett.) Ching in Bulletin of the Fan Memorial Institute of Biology 4: 51 (1933b). *Polypodium schraderi* Mett.: 98 (1857). *Niphobolus schraderi* (Mett.) Keyserl.: 39 (1873). *Polypodium lineare* Thunb. var. *schraderi* (Mett.) Sim: 276 (1915), nom. nov. for *Polypodium elongatum* Schrad.: 915 (1818), nom. illeg. *Phymatodes elongata* (Schrad.) Pappe & Raws.: 41 (1858). *Pleopeltis schraderi* (Mett.) Tardieu: 110 (1960); Schelpe: 152 (1970); Schelpe & Diniz: 155 (1979); Jacobsen: 308 (1983); Schelpe & Anthony: 160 (1986); Burrows: 196 (1990). Type: Prom. b. spei, *Hesse* s.n. (LE, holo.).

*Polypodium gueinzii* Mett.: 91 (1857), as '*gueintzii*'. *Lepisorus gueinzii* (Mett.) Ching: 51 (1933b), as '*gueintzii*'. Type: Ad portum Natalensem lectum, *Gueinzii* s.n. (LZ†, holo.; B, S, ?iso.).

**ILLUSTRATIONS:** Fig. 11i; Burrows: t. 45, fig. 199, 199a (1990).

Epilithic or epiphytic, in seasonally to permanently moist evergreen forests, mostly shaded, 20–1 400 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

**0161600 MICROSORUM** Link, Hortus regius botanicus berolinensis 2: 110 (1833b); Nooteboom: 294 (1997). Type: *Microsorium irregulare* Link (now *Microsorium punctatum* (L.) Copel.; *Acrostichum punctatum* L.).

*Phymatodes* C.Presl: 195 (1836), nom. illeg. p.p. excl. type.

*Neocheiropteris* Christ: 21 (1905a). Type: *Neocheiropteris palmatopedata* (Baker) Christ; *Polypodium palmatopedatum* Baker.

*Phymatosorus* Pic.Serm.: 457 (1973). Type: *Phymatosorus scolopendria* (Burm.f.) Pic.Serm.; *Polypodium scolopendrium* Burm.f.

Plants terrestrial, epilithic or epiphytic. *Rhizome* a highly perforated dictyostele, short- or long-creeping, laterally branched, dorsally with two alternate rows of short phyllopodia. *Fronds* monomorphic, approximate, articulate; stipe convex or adaxially flattened; lamina simple or pinnately lobed, entire; hypostomatic, stomata mostly of the dia-, polo- and copolocytic types; venation anastomosing, anadromous or catadromous, free included veins simple or branched, excurrent and recurrent, mostly ending in a hydathode. *Indumentum* composed of clathrate, pseudo-peltate paleae with numerous simple and/or branched glandular cells along the margin, the apex often ending in a small thin-walled cell, occurring on the rhizome and at the lamina base, often also with simple, 2–3-celled clavate hairs ending in a thin-walled cell occurring on the lamina surface. *Sori* small or large, superficial or slightly sunken, circular to oval, in one row on either side of the costa or irregularly scattered, on veinlets or at a plexus of veinlets; sporangium short-stalked, simple, 3-seriate below the capsule, the capsule globose, with 14–21 indurated annulus cells and a well defined stomium; exindusiate; receptacle with simple or branched, 2–3-celled, paraphyses apical cell often thin-walled. *Spores* ellipsoidal, monolete, 45–55 µm long. *Gametophyte*: mature thallus cordate, broader than long, midrib thin and wings spreading, rhizoids restricted to the midrib, superficially and marginally with unicellular, papillate, secretory hairs and superficially with clavate, multicellular glandular hairs; antheridium globose, the basal cell funnel-shaped, dehiscence by the collapse of the cap cell; archegonium neck short, curved towards the posterior, the neck canal cell binucleate, the apex swollen at maturity. Chromosome number based on  $2n = 72$ .

A genus of approximately 50 species widespread in the temperate and tropical parts of the Old World.

#### KEY TO THE SPECIES:

- 1a Mature fronds deeply pinnatifid; sori in one or two rows on either side of the costa:  
 2a Rhizome to 3 mm in diameter; lamina herbaceous to thinly herbaceous; sori superficial, not embossed ..... 3. *M. scandens*  
 2b Rhizome to 6 mm in diameter; lamina firmly herbaceous to coriaceous; sori somewhat sunken, embossed ..... 4. *M. scolopendria*  
 1b Mature fronds simple; sori scattered abaxially on the lamina:  
 3a Sori to 1 mm in diameter ..... 2. *M. punctatum*  
 3b Sori to 5 mm in diameter ..... 1. *M. pappei*

1. *Microsorium pappei* (Mett. ex Kuhn) Ching in Bulletin of the Fan Memorial Institute of Biology 4: 295 (1933b); Schelpe: 158 (1970); Schelpe & Diniz: 159 (1979); Jacobsen: 313 (1983); Schelpe & Anthony: 163 (1986); Burrows: 199 (1990); Nootboom: 345 (1997). *Polypodium pappei* Mett.: 150 (1868); Sim: 277 (1915). Type: Prom. bon. Spei, Caffraria, Rawson s.n. (BM, K!, isosyn.?). Natalia, deep dense glen, Richmond, 11/1864, Sanderson 107 (K!, isosyn.?).

*Polypodium normale* sensu Sim: 199 (1892).

**ILLUSTRATIONS:** Fig. 11J–L; Schelpe: t. 48, fig. B (1970).

Epilithic or epiphytic, in deep shade in moist evergreen forests, 700–1 500 m.

**DISTRIBUTION:** Mozambique, South Africa, Tanzania and Zimbabwe. Also in the Madagascan region.

2. *Microsorium punctatum* (L.) Copel. in University of California Publications in Botany 16: 111 (1929); Schelpe: 156 (1970); Schelpe: 121 (1977); Schelpe & Diniz: 159 (1979); Jacobsen: 312 (1983); Schelpe & Anthony: 163 (1986); Burrows: 199 (1990); Nootboom: 353 (1997). *Acrostichum punctatum* L.: 1524 (1763). *Polypodium punctatum* (L.) Sw.: 21 (1801), non Thunb. (1784); Sim: 282 (1915). *Pleopeltis punctata* (L.) Bedd.: 22 (1876). Type: China, Fothergill s.n. (missing).

*Polypodium iridioides* sensu Sim: 204 (1892).

**ILLUSTRATIONS:** Fig. 11M; Tardieu-Blot: t. 31, fig. 3, 4 (1964b).

Terrestrial, epilithic or epiphytic, in seasonally dry to moist evergreen forests, partially or deeply shaded, 10–1 000 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Pemba, Príncipe, São Tomé, Sierra Leone, South Africa, Tanzania, Uganda, Zanzibar and Zimbabwe. Also in the Madagascan region. Widespread in the palaeotropics.

3. \**Microsorium scandens* (G.Forst.) Tindale in American Fern Journal 50: 241 (1960); Nootboom: 359 (1997). *Polypodium scandens* G.Forst.: 81 (1786). *Phymatodes scandens* (G.Forst.) C.Presl: 196 (1836). *Phymatosorus scandens* (G.Forst.) Pic.Serm.: 459 (1973). Type: Australia, Forster s.n. (BM, holo.; K, iso.).

Terrestrial or epilithic, on moist streambanks, in light or deep shade, 100–800 m.

**DISTRIBUTION:** Naturalized in South Africa and Zimbabwe. Native of Australia and New Zealand.

4. *Microsorium scolopendria* (Burm.f.) Copel., University of California Publications in Botany 16: 112 (1929); Schelpe & Diniz: 160 (1970); Schelpe: 122 (1977); Jacobsen: 314 (1983); Schelpe & Anthony: 165 (1986); Burrows: 200 (1990); Nootboom: 361 (1997). *Polypodium scolopendrium* Burm.f.: 232 (1768). *Phymatodes scolopendria* (Burm.f.) Ching: 63 (1933c). *Phymatosorus scolopendria* Pic.Serm.: 460 (1973); Schelpe: 153 (1970). Type: India, Herb. Burmann (G!, holo.).

*Polypodium phymatodes* L.: 306, 307 (1771b), nom. illeg.; Sim: 196 (1892); Sim: 273 (1915). *Chrysopteris phymatodes* (L.) Fée: 270 (1852b). *Pleopeltis phymatodes* (L.) T.Moore: 78 (1858). Type: Habitat in India orientali, sine coll. s.n. (LINN 1251.6, holo.).

Schelpe & Diniz: 160 (1970);

**ILLUSTRATIONS:** Fig. 11N–P; Schelpe: t. 47, fig. 1, 2 (1970).

Terrestrial, epilithic or low-level epiphyte, in moist or seasonally moist evergreen forests, exposed or deeply shaded, 20–700 m.

**DISTRIBUTION:** Angola, Benin, Bioko, Cameroon, Central African Republic, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Ghana, Guinea, Kenya, Liberia, Mozambique, Nigeria, Pemba, Príncipe, São Tomé, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zanzibar and Zimbabwe. Also in the Madagascan region and the palaeotropics.

### 3. Tribus **Polypodieae**

*Polypodiaceae* Berliicht. & J.Presl subfam. *Pleopeltidoideae* Nayar: 234 (1970). Type: *Pleopeltis* Humb. et Bonpl. ex Willd.

#### KEY TO THE GENERA:

##### 1a Lamina simple:

- 2a Lamina with peltate paleae adaxially and abaxially ..... 0164900 **Pleopeltis**  
 2b Lamina with few filamentous paleae predominantly abaxially along the primary vein ..... 0164600 **Microgramma**

##### 1b Lamina pinnatifid or unequally lobed:

- 3a Lamina unequally lobed ..... 0167000 **X Pleopodium**  
 3b Lamina pinnatifid ..... 0163700 **Polypodium**

**0163700 POLYPODIUM** *L.*, *Species plantarum* 2: 1082 (1753). Lectotype: *Polypodium vulgare* *L.*, designated by Jonsell & Jarvis (1993).

Epilithic or epiphytic. *Rhizome* dictyostelic, widely creeping, dorsally set with two alternate rows of approximate or distally spaced short phyllopodia, laterally branched. *Fronde* monomorphic, articulated; stipe adaxially shallowly sulcate or convex; lamina pinnatifid; hypostomatic, stomata mostly of the polo- and copolocytic types; venation free, forked, ending in a hydathode near the margin, or reticulate, areole layered or not, without included veinlets or the primary areolae with a single, simple or forked excurrent veinlet, anadromous. *Indumentum* composed of clavate, 2–3-celled hairs occurring abaxially and/or adaxially on the lamina and with narrow, short-stalked, pseudo-peltate or peltate, often clathrate paleae occurring on the rhizome, axes and lamina surfaces. *Sori* large, circular, terminal on the acroscopic vein branch or at the apex of soral veins; sporangium long-stalked, simple, 3-seriate below the capsule, capsule globose, with 13–16 indurated annulus cells and a well defined stomium; exindusiate; receptacle nude or with simple, uniseriate hair-like trichomes. *Spores* ellipsoidal, monolete, tuberculate, 40–80 µm long. *Gametophyte*: mature thallus cordate, with a prominent midrib and broad spreading wings, superficially and along the margin with unicellular, papillate secretory hairs and with clavate, multicellular, glandular hairs bearing papillate unicellular branches and stalk cells; antheridium subglobose, the basal cell disk-shaped, dehiscence by the collapse of the cap cell; archegonium neck with 3–5 tiers of cells, curved towards the posterior, neck canal cell binucleate, the apex swollen at maturity. Chromosome number based on  $2n = 74$ .

A cosmopolitan genus of approximately 80 species.

#### KEY TO THE SUBGENERA:

- 1a Veins anastomosing towards the segment margin to form a single row of areolae, the fertile ones with a single included veinlet ..... 3. subgenus **Phlebodium**  
 1b Veins free:  
 2a Lamina abaxially densely set with peltate clathrate paleae ..... 2. subgen. **Marginaria**  
 2b Lamina abaxially without peltate clathrate paleae ..... 1. subgen. **Polypodium**

##### 1. Subgenus **Polypodium**

**Polypodium vulgare** *L.*, *Species plantarum* 2: 1085 (1753); Sim: 193 (1892); Sim: 270 (1915); Jacobsen: 317 (1983); Schelpe & Anthony: 157 (1986); Burrows: 193 (1990). *Ctenopteris vulgaris* (L.) Newman: 276 (1845). Type: Habitat in Europae rimis rupium, *sine coll. s.n.* *Herb. Burser* XX: 14 [UPS, lecto., designated by Jonsell & Jarvis (1993)].

**ILLUSTRATION:** Schelpe & Anthony: t. 50, fig. 3, 3a (1986).

Terrestrial or epilithic, on moist cliffs and ledges in montane regions, mostly lightly shaded, 1 000–2 500 m.

**DISTRIBUTION:** Lesotho and South Africa. Also in Europe and North America.

2. Subgenus **Marginaria** (Bory) C.Ch., *Index filicum*: L (1905). *Marginaria* Bory: 587 (1824). Type: *Marginaria polypodioides* (L.) Tidestr.; *Acrostichum polypodioides* L. (now *Polypodium polypodioides* (L.) Watt).

**Polypodium polypodioides** (L.) Watt in *Canadian Naturalist and Quarterly Journal of Science*, Ser. , 13: 158 (1867); Sim: 271 (1915). *Acrostichum polypodioides* L.: 1068 (1753). Type: Jamaica, *sine coll. s.n.* [BM, Herb. Plukenet!, lecto., designated by Weatherby (1939)].

subsp. **polypodioides** occurs in the neotropics.

subsp. **ecklonii** (Kunze) Schelpe in *Journal of South African Botany* 30: 189 (1964); Schelpe: 158 (1970); Schelpe & Diniz: 161 (1979); Jacobsen: 318 (1983); Schelpe & Anthony: 157 (1986); Burrows: 194 (1990). *Polypodium ecklonii* Kunze: 498 (1836). *Marginaria ecklonii* (Kunze) Pic.Serm.: 247 (1977a). Type: Eandem in arboris parasiticum in rupium faucibus inter Bashee et Key, Drège *s.n.* [B, lecto., designated by Roux (1986)]; Ubique in sylvis ad arboris inter Key et Omsamcaba, 200–700 ped., 1838, Drège *s.n.* (BM!, isopara.).

*Polypodium incanum* sensu Sim: 194 (1892).

**ILLUSTRATION:** Burrows: fig. 196 (1990).

Epilithic or epiphytic, in seasonally moist and wet forests in riverine and montane forests, light or deeply shaded, 200–1 700 m.

**DISTRIBUTION:** Malawi, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe.

3. Subgenus **Phlebodium** (R.Br.) C.Chr., Index filicum: I (1905). *Phlebodium* (R.Br.) J.Sm.: 58 (1841b). *Polypodium* L. sect. *Phlebodium* R.Br.: 7 (1838). Lectotype: *Phlebodium aureum* (L.) J.Sm.; *Polypodium aureum* L., designated by J. Smith (1875).

**KEY TO THE SPECIES:**

Fronds >300 mm long; lamina glaucous, herbaceous ..... 1. **P. aureum**  
Fronds mostly <300 mm long; lamina dark green, coriaceous ..... 2. **P. ensiforme**

1. **\*Polypodium aureum** L., Species plantarum 2: 1087 (1753). *Phlebodium aureum* (L.) J.Sm.: 59 (1841b). Type: Habitat in America, ad caudices vetustarum arborum, *sine coll. s.n.* [LINN 1251.10, lecto., designated by Proctor (1977)].

Terrestrial, epilithic or epiphytic, in moist evergreen riverine forests and forest margins, 100–700 m.

**DISTRIBUTION:** Introduced to South Africa and Zimbabwe. Native to Central America.

2. **Polypodium ensiforme** Thunb., Prodrum plantarum capensium: 172 (1800); Sim: 195 (1892); Sim: 272 (1915). *Marginaria ensiformis* (Thunb.) C.Presl: 188 (1836). *Phlebodium ensiforme* (Thunb.) J.Sm.: 59 (1841b). *Gonophlebium ensiforme* (Thunb.) Fée: 255 (1852b). *Phymatodes ensiformis* (Thunb.) Schelpe: 135 (1969a); Jacobsen: 316 (1983). *Phymatosorus ensiformis* (Thunb.) Pic.Serm.: 459 (1973). *Microsorium ensiforme* (Thunb.) Schelpe: 151 (1982); Schelpe & Anthony: 165 (1986); Burrows: 202 (1990), as '*Microsorium*'. Type: Grootvadersbosch, Thunberg s.n. (UPS-THUNB 24492!, holo.).

**ILLUSTRATIONS:** Fig. 11Q; Schelpe & Anthony: t. 51, fig. 2, 2a (1986).

Epilithic or epiphytic, mostly in moist evergreen forests, but also in exposed rock crevices, 20–500 m.

**DISTRIBUTION:** South Africa.

**0164600 MICROGRAMMA** C.Presl, Tentamen pteridographiae: 213, t. 9, fig. 7 (1836). Type: *Microgramma persicariifolia* (Schrad.) C.Presl; *Polypodium persicariifolium* Schrad., as '*persicariaefolium*'.

*Anapteris* J.Sm.: 5 (1857). Type: *Anapteris lycopodioides* (L.) J.Sm.; *Polypodium lycopodioides* L. (now *Microgramma lycopodioides* (L.) Copel.).

Plants epilithic or epiphytic. *Rhizome* a dorsiventral dictyostele, widely creeping, laterally branched, dorsally with two alternate rows of short, widely spaced phyllopodia. *Fronds* hemimorphic, the fertile marginally longer and narrower than the sterile, articulated; stipe short, adaxially shallowly sulcate; lamina simple, entire; hypostomatic, stomata mostly of the polo- and copolocytic types; venation anastomosing, tertiary anadromous, areoles with or without simple free included veinlets. *Indumentum* composed of narrow non-clathrate paleae with oblong thin-walled cells along the margin occurring on the rhizome and simple or filamentous paleae abaxially along the costa. *Sori* large, circular to oval, positioned at a plexus of predominantly quaternary veins in a single row on either side of the primary vein; sporangium stalk long, simple, 3-seriate below the capsule, capsule with 12–14 indurated annulus cells and a well defined stomium; exindusiate; receptacle paraphysate; paraphyses simple or apically with a few small thin-walled cells. *Spores* ellipsoidal, monolete, verrucate, 48–62 µm long. *Gametophyte*: mature prothallus cordate or strap-shaped, branching, clone forming and long-lived, rhizoids occur ventrally and dorsally, with unicellular, papillate, secretory trichomes and multicellular simple and/or branched hairs ventrally and dorsally; antheridia posterior; archegonia along the midrib. Chromosome number based on  $2n = 72$ .

A genus of approximately 15 species confined to the Neotropics with one species in Africa and the Madagascan region.

**Microgramma mauritiana** (Willd.) Tardieu in Flore de Madagascar et des Comores, Polypodiacees 5: 108 (1960). *Polypodium mauritanum* Willd.: 150 (1810). Type: Ile de France, Bory de St. Vincent s.n. (B-W 19606, holo.).

*Polypodium mackenii* Baker: 357 (1868a). *Polypodium lycopodioides* L. var. *mackenii* (Baker) Sim: 203 (1892); Sim: 280 (1915). Type: Natal, McKen s.n. (K, holo.).

*Microgramma lycopodioides* auct.

**ILLUSTRATIONS:** Fig. 11R & S; Schelpe & Anthony: t. 50, fig. 2, 2a (1986).

Epilithic or epiphytic, in moist humid evergreen forests and forest margins, exposed or partially shaded, 20–1 200 m.

**DISTRIBUTION:** Angola, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Gabon, Guinea, Kenya, Malawi, Mozambique, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zanzibar and Zimbabwe. Also in the Madagascan region.

**0164900 PLEOPELTIS** Humb. et Bonpl. ex Willd. Species plantarum, 4th edn, 5: 211 (1810). Type: *Pleopeltis angusta* Humb. et Bonpl. ex Willd.

Plants epilithic or epiphytic. *Rhizome* a dorsiventral dictyostele, widely creeping, laterally branched, dorsally with approximate or widely spaced short phyllopodia. *Fronds* monomorphic, articulated; stipe convex adaxially, narrowly winged; lamina simple, entire; hypostomatic, stomata mostly of the cyclocytic type; venation reticulate, anadromous and catadromous, forming a series of narrow costal, dome-shaped, and one or two rows of small marginal areoles, with or without simple or branched excurrent or recurrent free veinlets, endings often enlarged. *Indumentum* composed of clavate, 2-celled hairs occurring adaxially and abaxially on the lamina and

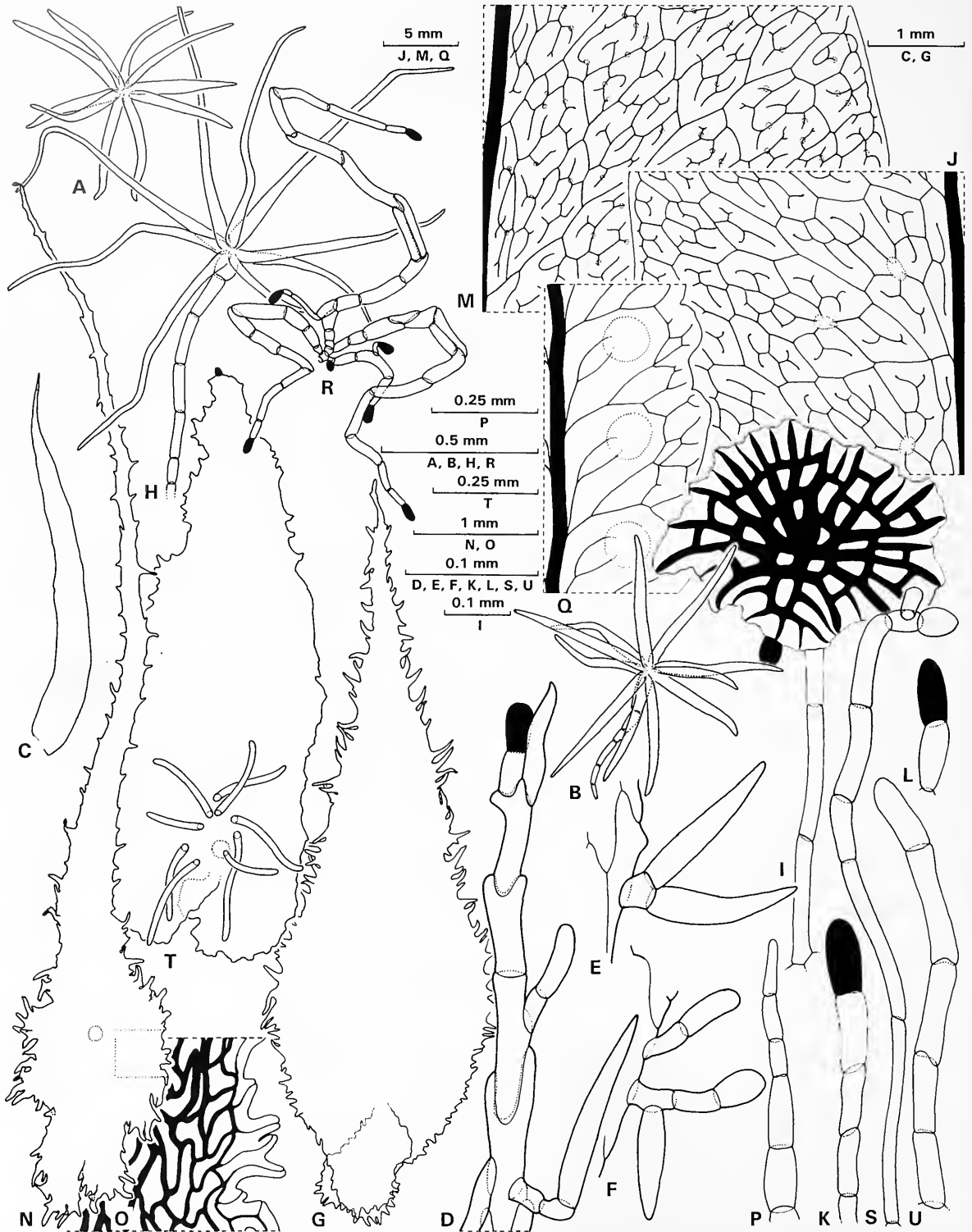


FIGURE 11A–U, Polypodiaceae. A–F, *Platycerium elephantotis*, A, hair from the adaxial surface of the lamina; B, hair from the abaxial surface of the lamina; C, rhizome palea; D, apex of C; E & F, hair complexes along the rhizome palea margin, *Dummeria* 674 (NBG); G, *Pyrrhosia africana*, rhizome palea, Roux 544 (NBG); H, *P. rhodesiana*, lamina hair, Taylor 3374 (NBG); I, *Lepisorus schraderei*, receptacular palea, Roux 853 (NBG); J–L, *Microsorium pappei*, J, venation; K & L, paraphyses, Zeyher s.n. (SAM); M, *M. punctatum*, venation, Roux 603 (NBG); N–P, *M. scolopendria*, N, rhizome palea; O, section of O; P, paraphyse, Roux 579 (NBG); Q, *Polypodium ensiforme*, venation, Roux 1997 (NBG); R & S, *Microgramme mauritiana*, R, hair from the abaxial surface of the lamina, Roux 665 (NBG); S, paraphyse, Buitendag 533 (NBG); T, *Pleopeltis macrocarpa*, rhizome palea, Roux 439 (NBG); U, *X Pleopodium simianum*, paraphyse, Holland s.n. (NBG). Scale bars: P, 0.25 mm; A, B, H, R, 0.5 mm; T, 0.25 mm; N, O, 1 mm; D, E, F, K, L, S, U, 0.1 mm; I, 0.1 mm.

peltate, clathrate paleae ending in a small thin-walled cell occurring on the rhizome, axes and lamina surfaces, rhizome paleae generally with long unicellular superficial trichomes around the point of attachment. *Sori* large, circular to oval, one per primary areole, innervated by simple or branched free veins or veinlets from secondary vein connectives, in a single row on either side of the primary vein; sporangium stalk long, simple, 3-seriate below the capsule; capsule with 12–14 indurated annulus cells and a well defined stomium; exindusiate; receptacular paleae peltate, clathrate. *Spores* ellipsoidal, monolete, verruculate, 62–70 µm long. *Gametophyte*: mature thallus cordate, broader than long, midrib thin, wings spreading, rhizoids restricted to the midrib, superficially and marginally with unicellular, papillate, secretory hairs and superficially with clavate, multicellular, glandular hairs; antheridium globose, the basal cell funnel-shaped, dehiscence by the collapse of the cap cell; archegonium neck short, curved towards the posterior, neck canal cell binucleate, apex swollen at maturity. Chromosome number based on  $2n = 74$ .

**Pleopeltis macrocarpa** (Bory ex Willd.) Kaulf. in Berlinisches Jahrbuch für die Pharmacie und für die damit verbundenen Wissenschaften. Berlin. 21: 41 (1820); Schelpe: 152 (1970); Schelpe: 119 (1977); Schelpe & Diniz: 156 (1979); Jacobsen: 309 (1983); Schelpe & Anthony: 160 (1986). *Polypodium macrocarpum* Bory ex Willd.: 127 (1810). *Drynaria macrocarpa* (Bory ex Willd.) Fée: 270 (1852b). Type: Réunion, *Bory de St. Vincent s.n.* (B-W 19629, holo.; P!, iso.).

*Polypodium adspersum* Schrad.: 915 (1818). Type: Cape, Hesse s.n. (LE, holo.).

*Pleopeltis ensifolia* Carm. ex Hook.: t. 62 (1823). Type: Cape, Carmichael s.n. (K, holo.).

*Polypodium lepidotum* Willd. ex Schldl.: 17 (1825b). *Pleopeltis lepidota* (Willd. ex Schldl.) C.Presl: 193 (1836). *Drynaria lepidota* (Willd. ex Schldl.) Fée: 270 (1852b). Type: Cape, Aubert du Petit-Thouars s.n. (B-W 19612, holo.).

*Polypodium lanceolatum* sensu Sim: 201 (1892); Sim: 278 (1915).

var. **macrocarpa**

**ILLUSTRATIONS:** Fig. 11T; Burrows: t. 45, fig. 198, 198a (1990).

Epilithic or epiphytic, in seasonally or permanently moist coastal, riverine and montane forests, moderately to deeply shaded, 20–2 000 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Coté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Guinea, Kenya, Lesotho, Liberia, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, Sierra Leone, Somalia, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

var. **laciniata** Stolze is confined to Peru and var. **interjecta** (Weath.) A.R.Sm. to Mexico and Guatemala.

**0167000 X PLEOPODIUM** Schelpe & N.C.Anthony in Bothalia 15: 557 (1985b). Type: X *Pleopodium simianum* Schelpe & N.C.Anthony.

Plants epilithic or epiphytic. *Rhizome* dictyostelic, widely creeping, branched, dorsally with short, widely spaced phyllopodia. *Frons* monomorphic, articulated; stipe terete, lamina unequally lobed; hypostomatic, stomata mostly of the cyclocytic type; venation reticulate, anadromous and catadromous, secondary vein complexes free or anastomosing, essentially forming a single row of dome-shaped primary areoles and a discontinuous row of small marginal areoles, with or without excurrent and recurrent, simple or branched included veinlets, often also with narrow rectangular costal areoles, vein endings often enlarged. *Indumentum* composed of clavate 2-celled hairs adaxially and abaxially on the lamina, and pseudo-peltate or peltate, clathrate paleae ending in a small thin-walled cell occurring on the rhizome, axes and lamina surfaces. *Sori* large, circular to oval, one per primary areole, in a single row on either side of the primary vein, innervated by a simple or forked vein, or a simple or forked veinlet arising from the secondary vein connectives, in a single row on either side of the primary vein; sporangia long-stalked, simple, 3-seriate below the capsule, capsule aborted; exindusiate; receptacle with simple pluricellular hairs ending in a gland-like cell. *Spores* aborted. Chromosome number unknown.

A genus of hybrid origin between *Polypodium* and *Pleopeltis* consisting of 10 or more species in Africa and the neotropics.

**X Pleopodium simianum** Schelpe & N.C.Anthony in Bothalia 15: 557 (1985b). Type: Natal, Lions River District, Everglades, 5 000 ft, 15/10/1964, Moll 1263 (BOL!, holo.; PRE, iso.).

*Polypodium lanceolatum* L. var. *sinuatum* Sim: 202 (1892); Sim: 279 (1915); Schelpe & Anthony: 159 (1986); Burrows: 194 (1990). *Pleopeltis macrocarpa* (Bory ex Willd.) Kaulf. forma *sinuata* (Sim) Schelpe: 96 (1969b). Type: Tsitsikamma, Atherstone s.n. (K, syn.); Fordyce Tree, Holland s.n. (NBG!, syn.).

A putative hybrid between *Polypodium polypodioides* (L.) Watt. subsp. *ecklonii* (Kunze) Schelpe and *Pleopeltis macrocarpa* (Bory ex Willd.) Kaulf.

**ILLUSTRATIONS:** Fig. 11U; Burrows: t. 197, 197a (1990).

Epilithic or epiphytic, in seasonally and permanently moist coastal, riverine and montane forests, moderately to deeply shaded, 100–1 500 m.

**DISTRIBUTION:** Kenya, South Africa, Uganda and Zimbabwe.

4. Tribus **Loxogrammeae** (Ching ex Pic.Serm.) R.M.Tryon & A.F.Tryon in Rhodora 84: 129 (1982a). *Loxogrammaceae* Ching ex Pic.Serm.: 11 (1974). Type: *Loxogramme* (Blume) C.Presl; *Antrophyum* Kaulf. sect. *Loxogramme* Blume.

**0167600 LOXOGRAMME** (Blume) C.Presl, Tentamen pteridographiae: 214, t. 9, fig. 8 (1836). *Antrophyum* Kaulf. sect. *Loxogramme* Blume: 73 (1829). Lectotype: *Loxogramme lanceolata* (Sw.) C.Presl; *Grammitis lanceolata* Sw.

Plants epilithic or epiphytic. *Rhizome* dictyostelic, dorsiventrally flattened, widely creeping, branched, dorsally with two alternate rows of short phyllopodia. *Fronds* monomorphic, articulated; stipe short, terete; lamina simple, entire, glabrous adaxially; hypostomatic, stomata mostly of the polycytic type; venation anastomosing, anadromous and catadromous. *Indumentum* composed of clavate, 2-celled hairs occurring abaxially on the lamina and basifixed clathrate paleae ending in a small thin-walled cell, often with short unicellular trichomes along the proximal margin of the paleae occurring on the rhizome and stipe base. *Sori* linear, at an acute angle in one row on either side of the primary vein; sporangium stalk simple, 3-seriate below the capsule, capsule globose, with 12–15 indurated annulus cells and a well defined stomium; exindusiate; receptacle with simple hairs ending in a gland-like cell. *Spores* ellipsoidal, monolete or trilete, papillate to rugate, 62–70 µm long. *Gametophyte*: mature thallus ribbon-shaped, often profusely branched, rhizoids mostly in marginal clusters, glabrous, gametangia borne on scattered superficial cushions ventrally behind the meristematic region; antheridium 3-celled; archegonium neck with 3 tiers of cells, nearly straight, neck canal cell binucleate; vegetative reproduction by unicellular marginal gemmae. Chromosome number based on  $2n = 70$ .

A genus of approximately 22 species occurring throughout the tropics and warm temperate areas of the world with the largest concentration of species in Asia with one species in Central America. A conservative approach is followed here by including the genus in the family Polypodiaceae.

KEY TO THE SPECIES:

- Rhizome widely creeping; sori hardly overlapping those next above ..... 1. ***L. abyssinica***  
Rhizome short creeping; sori usually overlapping those next above ..... 2. ***L. latifolia***

1. ***Loxogramme abyssinica* (Baker) M.G.Price** in American Fern Journal 74: 61 (1984). *Gymnogramma abyssinica* Baker: 517 (1874a). Type: *Abyssinia*, Schimper 1445 (K, holo.).

*Loxogramme lanceolata* auct.

ILLUSTRATION: Schelpe & Anthony: t. 49, fig. 3 (1986).

Epilithic or epiphytic, in seasonally or permanently moist coastal and montane evergreen forests, mostly deeply shaded, 70–2 000 m.

DISTRIBUTION: Angola, Bioko, Burundi, Cameroon, Central African Republic, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Príncipe, Rwanda, São Tomé, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

2. ***Loxogramme latifolia* Bonap.**, Notes ptéridographiae 14: 334 (1923b); Schelpe: 116 (1977). Type: Congo belge. Forêt vierge aux bords de la Semliki, Bequaert 3073 (P, holo.).

ILLUSTRATION: Tardieu-Blot: t. 40, fig. 7 (1953b).

DISTRIBUTION: Angola, Bioko, Cameroon, Democratic Republic of the Congo, Ghana and Uganda.

22. **GRAMMITIDACEAE** (C.Presl) Ching in Sunyatsenia 5: 264 (1940a). *Filicaceae* L. tribus *Grammitideae* C.Presl: 205 (1836), as '*Grammitaceae*'. Type: *Grammitis* Sw.

Plants epilithic or epiphytic. *Rhizome* solenostelic, with 1–3 narrowly linear or arched vascular bundles, short and radially symmetric or short- or long-creeping, dorsiventral, laterally branched or not, phyllopodia in distinct dorsal rows or not; roots ventral, the cortex sclerenchymatous, the inner cortex with passage cells. *Fronds* monomorphic, approximate to widely spaced, articulated or not; stipe short or long, terete, often narrowly winged; lamina simple or pinnatifid; hypostomatic, stomata mostly of the anomo- and polycytic types; veins free, simple or forked, or rarely anastomosing, often ending in a hydathode near the margin. *Indumentum* composed of sessile basifixed, concolorous or clathrate paleae ending in a gland-like cell or a cellular complex composed of a gland-like and an acicular cells occurring on the rhizome, and simple and/or branched compound hairs occurring on the axes and lamina surfaces, or with long, unicellular acicular hairs along the rhizome, stipe and adaxially and abaxially along the costa. *Sori* circular or elliptic, borne on the acroscopic vein branch; sporangium stalk simple, uniseriate for most of its length, 3-seriate below the capsule; capsule with 8–18 indurated annulus cells and a well defined stomium; exindusiate; receptacle nude or with simple 2–3-celled capitate hairs. *Spores* green, spheroidal, trilete, granulate, papillate or tuberculate, 36–62 µm long. *Gametophyte*: spore germination takes place before dehiscence; germ filament often extensively branched; prothallial development of the *Adiantum*-type; mature thallus strap-shaped with an interrupted midrib, rhizoids borne marginally or submarginally, with 1- or 2-celled club-shaped hairs and with branched hairs ending in a glandular cell along the margin; antheridium 3-celled, the basal cell long, the cap cell divided or not; archegonia positioned ventrally behind the notch, the neck curved towards the posterior, with up to 4 tiers of cells, the neck canal cell binucleate. Chromosome number based on  $2n = 72$  or  $74$ , but frequently also  $64$  or  $66$ .

The family Grammitidaceae is closely related to the Polypodiaceae, as is supported by the chromosome numbers based on  $2n = 72$  and  $74$ , but the lines of descent from a possibly common ancestor are different (Pichi Sermolli 1977b).

KEY TO THE GENERA:

- 1a Lamina simple, entire ..... 0173000 **Grammitis**  
1b Lamina pinnatifid or shallowly to deeply lobed or serrate:  
2a Hydathodes absent or obscure:  
3a Lamina differentiated into a serrate, sterile, proximal part and an entire, fertile, distal part ..... 0173600 **Cochlidium**  
3b Lamina not differentiated into distinct sterile and fertile parts ..... 0173800 **Zygophlebia**  
2b Hydathodes present and conspicuous:  
4a Sori circular or elliptic, medial or simple, free veins ..... 0171800 **Lellingeria**



4b Sori circular or elliptic, at vein endings:

- 5a With unicellular acicular hairs on the rhizome and lamina axes ..... 0173700 **Terpsichore**  
 5b With pluricellular acicular hairs on the lamina axes ..... 0171500 **Melpomene**

**0171500 MELPOMENE** A.R.Sm. & R.C.Moran in Novon 2: 426 (1992). Type: *Melpomene monoliformis* (Lag. ex Sw.) A.R.Sm. & R.C.Moran; *Polypodium monoliforme* Lag. ex Sw.

Plants epilithic. *Rhizome* solenostelic, dorsiventral, short- or long-creeping. *Fronde* monomorphic, approximate to widely spaced; stipe terete, narrowly winged; lamina narrowly linear, pinnatifid; hypostomatic, stomata mostly of the anomocytic type; venation free, simple or forked. *Indumentum* composed of clathrate, basifixed paleae ending in a branched cellular complex composed of a small gland-like cell and a unicellular acicular cell occurring on the rhizome, also with simple pluricellular acicular hairs with oblique transverse walls, with branched trichomes composed of gland-like and hair-like cells on the axes, and with 2- or 3-celled clavate trichomes and simple hair-like trichomes abaxially on the lamina. *Sori* elliptic, at the vein ends; sporangium stalk slender, simple, uniseriate for most of its length, 3-seriate below the capsule; capsule globose, glabrous, with 11–14 indurated annulus cells and a well defined stomium; exindusiate; receptacle and surrounds with long, simple acicular hairs with oblique transverse walls. *Spores* green, globose, trilete, tuberculate. *Gametophyte*: mature thallus strap-shaped with an interrupted midrib, rhizoids borne marginally or submarginally, with 1- or 2-celled club-shaped hairs and with branched hairs ending in a glandular cell along the margin; antheridium 3-celled, the basal cell long, the cap cell divided or not; archegonia ventrally behind the notch, neck curved towards the posterior, with up to 4 tiers of cells, neck canal cell binucleate. Chromosome number based on  $2n = 74$ .

A genus of approximately 20 species occurring primarily in the neotropics with one extending to Africa.

**Melpomene flabelliformis** (Poir.) A.R.Sm. & R.C.Moran in Novon 2: 430 (1992). *Polypodium flabelliforme* Poir.: 519 (1804). *Grammitis flabelliformis* (Poir.) Morton: 57 (1967). *Xiphopteris flabelliformis* (Poir.) Schelpe: 217 (1967); Schelpe: 143 (1970); Schelpe & Diniz: 145 (1979); Jacobsen: 298 (1983); Schelpe & Anthony: 152 (1986). Type: Cette plante croît dans la Martinique, sur le tronc des vieux arbres, *sine coll.* s.n. Plumier, *Traité des fougères de l'Amérique*: t. 87 (1705), left-hand figure (icon), designated by Pichi Sermolli (1983a).

*Polypodium rigescens* Bory ex Willd.: 183, 184 (1810). *Ctenopteris rigescens* (Bory ex Willd.) J.Sm.: 184 (1875). *Xiphopteris rigescens* (Bory ex Willd.) Alston: 27 (1956a). *Grammitis rigescens* (Bory ex Willd.) Lellinger: 383 (1985); Burrows: 186 (1990). Type: Habitat in arboribus montium insulae Borboniae, *Bory de St. Vincent* s.n. (B-W 19668, holo.; P, FI, iso.).

**ILLUSTRATIONS:** Fig. 12A & B; Burrows: t. 44, fig. 185, 185a (1990).

Epilithic or epiphytic, in moist montane forests and rock crevices, shaded, 1 200–2 000 m.

**DISTRIBUTION:** Bioko, Cameroon, Democratic Republic of the Congo, Kenya, Lesotho, Malawi, Mozambique, Rwanda, Somalia, South Africa, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region and the neotropics.

**0171800 LELLINGERIA** A.R.Sm. & R.C.Moran in American Fern Journal 81: 76 (1991). Type: *Lellingeria apiculata* (Kunze ex Klotzsch) A.R.Sm. & R.C.Moran; *Polypodium apiculatum* Kunze ex Klotzsch.

*Polypodium* L. sect. *Prosechium* T.Moore: lxxi (1857). Type: *Lellingeria pendula* (Sw.) A.R.Sm. & R.C.Moran; *Polypodium pendulum* Sw. and *L. suspensa* (L.) A.R.Sm. & R.C.Moran; *P. suspensum* L.

Plants epilithic. *Rhizome* solenostelic, radially symmetric, short-creeping. *Fronde* monomorphic, approximate; stipe terete; lamina pinnatifid; hypostomatic, stomata mostly of the anomocytic type; venation simple, free, ending in a conspicuous oblong hydathode near the margin. *Indumentum* composed of narrow, sessile, clathrate paleae ending in a thin-walled cell occurring on the rhizome and 2-cellular hairs occurring abaxially on the lamina. *Sori* circular or elliptic, medial, one on each lobe; sporangium stalk slender, simple, 3-seriate below the capsule; capsule glabrous, with 10–14 indurated annulus cells and a well defined stomium; exindusiate; receptacle with 2–3-celled paraphyses. *Spores* green, globose, trilete, papillate, 30–38  $\mu\text{m}$  long. Chromosome number based on  $2n = 64$  and 66.

A genus of approximately 60 primarily neotropical species.

**Lellingeria oosora** (Baker) A.R.Sm. & R.C.Moran in American Fern Journal 81: 85 (1991). *Polypodium oosorum* Baker: 154, 155 (1887c). *Xiphopteris oosora* (Baker) Alston: 26 (1956a); Schelpe: 143 (1970). *Grammitis oosora* (Baker) J.E.Burrows: 186 (1990). Type: Pico de S. Thomé, 1950, *Moller 1337* (K, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 42, fig. 1, 2 (1953b).

**DISTRIBUTION:** Bioko, Cameroon, Guinea, Malawi, Rwanda, São Tomé, Tanzania and Zimbabwe. Also in Madagascar.

**0173000 GRAMMITIS** Sw. in Journal für die Botanik 1800, 2: 3, 17 (1801). Lectotype: *Grammitis marginella* (Sw.) Sw.; *Polypodium marginellum* Sw., designated by Christensen (1905).

Plants epilithic. *Rhizome* solenostelic, short-creeping. *Fronde* monomorphic, approximate; stipe short, terete; lamina simple, entire, glabrous; hypostomatic, stomata mostly of the anomo- and polocytic types; venation free, simple or forked, ending a short distance from the margin. *Indumentum* composed of concolorous, narrow, basifixed, entire paleae ending in a small thin-walled cell, or simple and compound hairs ending in a gland-like cell occurring on the rhizome. *Sori* circular to elliptic, on an acroscopic vein branch, in a single row on either side of the costa; sporangium stalk slender, simple, uniseriate for most of its length, 3-seriate below the capsule; capsule globose, with 8–12 indurated annulus cells and a well defined stomium; exindusiate; receptacle with 2- or 3-celled hairs

ending in a large gland-like cell. Spores spheroidal, trilete, granulate, 48–62 µm long. *Gametophyte*: mature thallus strap-shaped with an interrupted midrib, rhizoids borne marginally or submarginally, with 1- or 2-celled club-shaped hairs and with branched hairs ending in a glandular cell along the margin; antheridia borne ventrally, 3-celled, the basal cell long, the cap cell divided or not; archegonia borne ventrally behind the notch, the neck curve towards the posterior, with up to 4 tiers of cells, the neck canal cell binucleate. Chromosome number based on  $2n = 72$  or  $74$ .

A genus of approximately 160 species occurring throughout the tropics and south temperate parts of the world.

#### KEY TO THE SPECIES:

- 1a Fronds with short castaneous hairs at intervals along the margin of young fronds ..... 2. ***G. nanodes***  
 1b Fronds without hairs along the margins:  
 2a Rhizome erect; sori usually >10 pairs ..... 1. ***G. magellanica***  
 2b Rhizome short-creeping to long-creeping; sori <10 pairs ..... 3. ***G. poeppigiana***

1. ***Grammitis magellanica*** Desv. in *Magazin für die neuesten Entdeckungen in der gesammten Naturkunde, Gesellschaft Naturforschender Freunde zu Berlin* 5: 313 (1811). Type: Habitat ad Fretum magellanicum, *sine coll. s.n.* (P, holo.).

subsp. ***magellanica***

Epilithic, in moist, shaded rock crevices on low cliffs and boulders, 20–100 m.

**DISTRIBUTION:** Marion and Prince Eduard Islands, circum-Antarctic.

subsp. ***nothofageti*** Parris is confined to New Zealand and Tasmania.

2. ***Grammitis nanodes*** (Peter) Ching in *Bulletin of the Fan Memorial Institute of Biology* 10: 241 (1941a); Schelpe: 141 (1970); Schelpe & Diniz: 144 (1979); Jacobsen: 296 (1983); Burrows: 184 (1990). *Polypodium nanodes* Peter: 27 (1929). Type: Deutsch-Ostafrika, W Usambara: Uw auf d. Kamm des Bergzuges Kisimba üb. Mazumbai, 1900, *Peter 16492* (not located).

**ILLUSTRATIONS:** Schelpe: t. 44A (1970).

Epilithic, in moist evergreen montane forests, deeply shaded, 1 750–2 050 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, Tanzania and Zimbabwe.

3. ***Grammitis poeppigiana*** (Mett.) Pic.Serm. in *Webbia* 32: 461 (1978a); Jacobsen: 297 (1983), as '*poeppigiana*'; Schelpe & Anthony: 152 (1986); Burrows: 183 (1990). *Polypodium poeppigianum* Mett.: 37 (1857). Type: Prom. b. spei, in fissuris rupium in fauce umbrosa montium Hott. holland, Pöppig s.n. (Wt). Stellenbosch, Jonkershoek, Victoria Peak, *Esterhuysen 29290* [BOL!, neo., designated by Schelpe (1978); E, K, MO, isoneo.].

*Polypodium magellanicum* sensu Alston & Schelpe: 163, 175 (1952).

**ILLUSTRATIONS:** Fig. 12C; Schelpe & Anthony: t. 48, fig. 2 (1986).

Epilithic, in moist or seasonally moist crevices on cliffs and boulders, exposed or partially shaded, 20–1 400 m.

**DISTRIBUTION:** Marion Island and South Africa, circum-Antarctic.

**0173600 COCHLIDIUM** Kaulf. in *Berlinisches Jahrbuch für die Pharmacie und für die damit verbundenen Wissenschaften*. Berlin. 21: 36 (1820). Type: *Cochlidium graminoides* (Sw.) Kaulf.; *Acrostichum graminoides* Sw.

*Xiphopteris* Kaulf.: 35 (1820). Lectotype: *Xiphopteris serrulata* (Sw.) Kaulf.; *Acrostichum serrulatum* Sw., designated by J. Smith (1875).

*Micropteris* Desv.: 217 (1827). Lectotype: *Micropteris serrulata* (Sw.) Desv.; *Acrostichum serrulatum* Sw., designated by Copeland (1947).

Plants epilithic or epiphytic. Rhizome solenostelic, with 1–3 narrowly linear or arched vascular bundles, short-creeping. Fronds monomorphic, approximate; stipe short, terete; lamina simple, the margins serrate; hypostomatic, stomata mostly of the polocytic type; venation free, simple, ending near the margin. Indumentum composed of concolorous, cordate-imbricate paleae ending in an oblong thin-walled cell, occurring on the rhizome, and 2–8-celled hairs ending in an enlarged oblong thin-walled cell, with thickened intercellular walls occurring abaxially and adaxially on the lamina. Sori confined to the lamina apex, confluent at maturity, basal on the veins, parallel to the primary vein or costa and are terminated by an abruptly geniculate sterile portion of the vein; sporangium stalk slender, uniseriate at the base, 3-seriate below the capsule, capsule with 8–10 indurated annulus cells; receptacle nude. Spores 36–40 µm long. *Gametophyte*: spore germination takes place before dehiscence; mature thallus strap-shaped, with an interrupted midrib, rhizoids borne marginally or submarginally, with 1- or 2-celled club-shaped hairs and with branched hairs ending in a glandular cell along the margin; antheridia ventrally, 3-celled, the basal cell long, the cap cell often divided; archegonia borne ventrally behind the notch, the neck curved towards the posterior, with 4 tiers of cells, the neck canal cell binucleate; apogamy reported. Chromosome number unknown.

A genus of 16 species that are largely confined to the neotropics.

***Cochlidium serrulatum*** (Sw.) L.E.Bishop in *American Fern Journal* 68: 80 (1978). *Acrostichum serrulatum* Sw.: 128 (1788). *Grammitis*

*serrulata* (Sw.) Sw.: 18 (1801); Burrows: 187 (1990). *Asplenium serrulatum* (Sw.) Bernh.: 48 (1806). *Xiphopteris serrulata* (Sw.) Kaulf.: 85 (1824); Schelpe: 144 (1970); Jacobsen: 299 (1983). *Micropteris serrulata* (Sw.) Desv.: 217 (1827). *Polypodium serrulatum* (Sw.) Mett.: 30 (1857), non Sw. (1801). Type: Ind. occ. (Jamaica), Swartz s.n. (S!, holo.; UPS, iso.).

**ILLUSTRATION:** Tardieu-Blot: t. 42, fig. 7, 8 (1953a).

Epilithic or epiphytic, in moist montane forests, deeply shaded, 400–1 200 m.

**DISTRIBUTION:** Annobon, Bioko, Côte d'Ivoire, Gabon, Guinea, Liberia, Sierra Leone and Zimbabwe. Also in the Madagascan region and the neotropics.

**0173700 TERPSICHORE** A.R.Sm. in Novon 3: 479 (1993). Type: *Terpsichore asplenifolium* (L.) A.R.Sm.; *Polypodium asplenifolium* L.

Plants epiphytic. *Rhizome* solenostelic, short-creeping. *Fronde* monomorphic, approximate; stipe short, terete; lamina pinnatifid; hypostomatic, stomata mostly of the anomocytic type; veins simple, free, ending in a hydathode. *Indumentum* composed of long unicellular acicular hairs along the rhizome, stipe and adaxially and abaxially along the costa, adaxially also with 2- or 3-celled simple or branched hairs. *Sori* circular, positioned at a vein ending, occurring in a single row on either side of a secondary vein; sporangium stalk slender, simple, uniseriate for most of its length, 3-seriate below the capsule; capsule globose, with 12–17 indurated annulus cells; receptacle paraphysate, paraphyses simple or branched. *Spores* trilete and globose or monolet and elliptic. *Gametophyte*: mature thallus strap-shaped with an interrupted midrib, rhizoids borne marginally or submarginally, with 1- or 2-celled club-shaped hairs and with branched hairs ending in a glandular cell along the margin; antheridia 3-celled, basal cell long, cap cell divided or not; archegonia borne ventrally behind the notch, the neck curved towards the posterior, with up to 4 tiers of cells, the neck canal cell binucleate. Chromosome number based on  $2n = 74$ .

A genus of approximately 50 neotropical species with one extending to Africa and the Madagascan region.

**Terpsichore cultrata** (Bory ex Willd.) A.R.Sm. in Novon 3: 486 (1993). *Polypodium cultratum* Bory ex Willd.: 187 (1810). *Xiphopteris cultrata* (Bory ex Willd.) Schelpe: 217 (1967). *Grammitis cultrata* (Bory ex Willd.) Proctor: 35 (1961). Type: Jamaica, Swartz s.n. (B-W 19670, holo.).

*Polypodium elasticum* Bory ex Willd.: 183 (1810). *Polypodium cultratum* Bory ex Willd. var. *elasticum* (Bory ex Willd.) Baker: 327 (1874a). *Ctenopteris elastica* (Bory ex Willd.) Copel.: 426 (1956). *Xiphopteris elastica* (Bory ex Willd.) Alston: 26 (1956a). Type: Habitat in montibus altis insulae Borboniae, arboribus parasiticum, sine coll. s.n. (not located).

**DISTRIBUTION:** Bioko, Cameroon and Malawi. Also in the Madagascan region.

**0173800 ZYGOPHLEBIA** L.E.Bishop in American Fern Journal 79: 107 (1989). Type: *Zygophlebia sectifrons* (Kunze ex Mett.) L.E.Bishop; *Polypodium sectifrons* Kunze ex Mett.

Plants epiphytic. *Rhizome* a dorsiventral siphonostele, short-creeping. *Fronde* monomorphic, approximate; stipe terete; lamina pinnatifid; hypostomatic, stomata mostly of the anomo- and polocytic types; veins frequently anastomosing. *Indumentum* composed of basifixed, concolorous paleae with unicellular glandular cells along the margin occurring on the rhizome, and with branched hairs occurring on the axes and lamina surface. *Sori* submarginal on acroscopic vein branch, circular; sporangium stalk simple, uniseriate for most of its length, 3-seriate below the capsule, capsule globose, with 12–18 indurated annulus cells and a well defined stomium; exindusiate; receptacle with 2- or 3-celled paraphyses. *Spores* spheroidal, trilete, 28–60 µm in diameter. Chromosome number based unknown.

A genus of approximately eight species largely confined to the neotropics, but with one species widespread in the palaeotropics.

**Zygophlebia villosissima** (Hook.) L.E.Bishop in American Fern Journal 79: 117 (1989). *Polypodium villosissimum* Hook.: 197 (1863). *Grammitis villosissima* (Hook.) Ching: 241 (1941c). *Ctenopteris villosissima* (Hook.) W.J.Harley: 92 (1955). *Xiphopteris villosissima* (Hook.) Alston: 27 (1956a); Schelpe: 142 (1970). Type: Sierra Leone, Sugar-loaf Mountains, Barter s.n. [K, lecto., designated by Schelpe (1969b)].

**ILLUSTRATION:** Tardieu-Blot: t. 42, fig. 7, 8 (1953a).

Epiphytic, in moist evergreen montane forests, moderately to deeply shaded, 1 800–1 900 m.

**DISTRIBUTION:** Annobon, Bioko, Cameroon, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Guinea, Liberia, Malawi, Rwanda, São Tomé, Sierra Leone and Tanzania. Also in the Madagascan region.

**23. DAVALLIACEAE** Mett. ex A.B.Frank, Synopsis der Pflanzenkunde, 2nd edn, 3: 1474 (1877). Type: *Davallia* Sm.

Plants epilithic or epiphytic. *Rhizome* dictyostelic, creeping, laterally branched, with short, approximate to widely spaced phyllopodia arranged dorsally; roots ventral, cortex sclerenchymatous, and the inner cortex with passage cells. *Fronde* monomorphic, articulated at the stipe base; stipe and rachis adaxially convex with lateral ridges, ridges connected to those of the lower order axes; lamina monomorphic, pinnately compound, anadromous; hypostomatic, stomata mostly of the anomo- and eupolocytic types; venation anadromous, free, pinnately branched, ending near the margin. *Indumentum* composed of narrow, peltate paleae with short marginal outgrowths formed by projections of two adjacent cells occurring on the rhizome, and short, simple, uniseriate, gland-tipped hairs occurring on the lamina. *Sori* situated in the fork of a vein near the margin; sporangium stalk long, simple, 3-seriate below the capsule; capsule ellipsoidal, with 11–16 indurated annulus cells and a well defined stomium; indusium attached at the sides forming a pouch-like structure, entire. *Spores* ellipsoidal, monolet, verrucate, to 54 µm long. *Gametophyte*: prothallial development of the

*Aspidium*-type; mature thallus upright, mostly one cell layer thick, with unicellular papillate, thin-walled, chlorophyllous hairs along the margins and superficially, older hairs with cap-like secretions, often also with 4-celled hairs that may be branched; antheridia first formed, occurring along the margins and superficially, of the typical leptosporangiate type; archegonia on the ventral surface, neck curved, with 5–7 tiers of cells, neck canal cell binucleate. Chromosome number based on  $2n = 80$ .

The affinity of the Davalliaceae has been much debated and its position remains partially unresolved. The dorsiventral rhizome with roots confined to the ventral surface, the highly dissected stele with unconnected leaf-gaps and the stipes that are articulated to phyllopodia, suggest it not being closely related to any other group. However, the chromosome number based on  $2n = 80$  together with the hairs that are similar in structure to the non-acicular type found in the Tectarioid ferns suggest an affinity to that group (Sen *et al.* 1972). Kato (1985) suggested a Davallioideae-Oleandroid ancestor for the family. *RbcL* studies of Hasebe *et al.* (1995) suggest that the Davalliaceae, Polypodiaceae, Grammitidaceae, Oleandraceae, Nephrolepidaceae and some members of the Dryopteridaceae share a recent common ancestor.

**0177300 DAVALLIA** Sm. in Mémoires de l'Académie des Sciences de Turin 5: 414, t. 9, fig. 6 (1793); Nootboom: 155 (1994). Lectotype: *Davallia canariensis* (L.) Sm.; *Trichomanes canariensis* L., designated by Nootboom (1994).

Description as for the family. The genus has a largely palaeotropical distribution, but also extends to Macaronesia, SE Europe and islands in the southern Indian Ocean.

Nootboom (1994) recognized two sections with material from southern Africa belonging to section *Davallia*.

**Davallia denticulata** (Burm.f.) Mett. ex Kuhn

var. **denticulata**: Nootboom: 178 (1994).

*Davallia denticulata* (Burm.f.) Mett. ex Kuhn, Filices Deckenianae: 27 (1867). *Adiantum denticulatum* Burm.f.: 236 (1768). Type: Plukenet, Phytographia 3: 151, t. 180, fig. 4 (1692), icon.

*Trichomanes chaerophylloides* Poir.: 80 (1808). *Davallia chaerophylloides* (Poir.) Steud.: 146 (1824); Sim: 128 (1915); Schelpe: 167 (1970); Schelpe: 133 (1977); Schelpe & Diniz: 173 (1979); Jacobsen: 327 (1983); Schelpe & Anthony: 171 (1986); Burrows: 209 (1990). *Humata chaerophylloides* (Poir.) Desv.: 325 (1827). Type: Cette plante croît à l'île de Madagascar, *sine coll.* (G-DC, syn.); Herb. Thouars (P!, syn.).

*Davallia nitidula* Kunze: 545 (1836); Sim: 62 (1892). Type: Omsamculo, ad rupes, Drège *s.n.* [LZt, syn.; BM!, lecto., designated by Roux (1986)].

*Davallia denticulata* (Burm.f.) Mett. ex Kuhn var. *intermedia* Mett. ex Kuhn: 158 (1868). Type: Natal, Guenzius, Drège *s.n.*; Angola, Welwitsch 56; Tropical Africa, Mann *s.n.*; Comoro Islands, Peters *s.n.* & Boivin 1599; Madagascar, Boivin, Lyall *s.n.*; Seychelles, Kersten 70. Syntypes not located.

**ILLUSTRATIONS:** Fig. 12D–G; Schelpe: t. 52, fig. 1, 2 (1970).

Epilithic or epiphytic, in moist and seasonally dry forests, exposed to deeply shaded, 20–1 700 m.

**DISTRIBUTION:** Angola, Annobon, Benin, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Kenya, Liberia, Mozambique, Nigeria, São Tomé, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Madagascan region, palaeotropical.

var. **elata** (G.Forst.) Mett. ex Kuhn is widespread in SE Asia.

**24. NEPHROLEPIDACEAE** Pic.Serm. in Webbia 29: 8 (1974). Type: *Nephrolepis* Schott

Plants terrestrial, epilithic or epiphytic. *Rhizome* dictyostelic, short-creeping or erect, often with protostelic runners, often also with tubers; roots with a parenchymatous outer cortex and a sclerenchymatous inner cortex. *Fronde* monomorphic, approximate; stipe and rachis adaxially sulcate; lamina pinnately compound, pinnae articulated along the rachis; hypostomatic, stomata mostly of the aniso- and diacytic types; venation free, simple or forked, ending in a hydathode near the margin, appear isodromous. *Indumentum* composed of pseudo-peltate or peltate paleae generally with short and long outgrowths at the base occurring on the rhizome, axes and lamina surfaces, and 2–3-celled glandular hairs occurring on the lamina. *Sori* reniform, at the end of an abbreviated acroscopic vein branch; sporangium stalk slender, simple, 3-seriate below the capsule; capsule globose to ellipsoidal, with 13–14 indurated annulus cells and a well defined stomium; indusium reniform, entire, opening towards the margin. *Spores* ellipsoidal, monolete, irregularly tuberculate, 25–34  $\mu\text{m}$  long. *Gametophyte*: spore germination of the *Vittaria*-type; germ filament terminates in a hair; prothallial development of the *Aspidium*-type; mature thallus cordate to spatulate, with a thickened central cushion bearing rhizoids ventrally, bearing glandular and eglandular hairs on both surfaces and the margin, often with 2–10-celled hairs on the cushion; antheridium 3-celled, the cap cell undivided; archegonium neck with 4–6 tiers of cells, curved towards the anterior. Chromosome number based on  $2n = 82$ .

Pichi Sermolli (1974), when describing the family, also included *Arthropteris* J.Sm. ex Hook.f. in the Nephrolepidaceae. Based on its anatomy, stoma types and spore morphology the Nephrolepidaceae is considered monotypic and *Arthropteris* is placed in the Oleandraceae. This view is supported by the *rbcL* studies of Hasebe *et al.* (1995). Nephrolepidaceae forms part of the Davalliaceae-Oleandraceae alliance (Hasebe *et al.* 1995).

**0178400 NEPHROLEPIS** Schott, Genera filicum: 1, t. 3 (1834). Lectotype: *Nephrolepis exaltata* (L.) Schott; *Polypodium exaltatum* L., designated by J. Smith (1875).

*Lepidoneuron* Fée: 301 (1852b). Type: *Lepidoneuron biserratum* (Sw.) Fée; *Aspidium biserratum* Sw. (now *Nephrolepis biserrata* (Sw.) Schott).

Description as for the family.

A genus of approximately 30 species occurring throughout the warmer parts of the world, but with the greatest number of species concentrated in SE Asia.

#### KEY TO THE SPECIES:

- 1a Sori linear, submarginal ..... 1. **N. acutifolia**
- 1b Sori circular or lunate, intramarginal:
  - 2a Pinnae linear; not markedly auriculate; sori opening towards the pinna margin; not tuberous ..... 2. **N. biserrata**
  - 2b Pinnae oblong-attenuate; prominently auriculate; sori opening towards the pinna apex; tuberous:
    - 3a Fronds <300 mm long; pinnae distinctly remote, triangular to ovate-oblong, obliquely truncate on the basiscopic side of the hardly enlarged base ..... 4. **N. delicatula**
    - 3b Fronds >300 mm long; pinnae approximate to imbricate, narrowly triangular from a widely enlarged base, auriculate on the acroscopic side:
      - 4a Rachis glabrous or subglabrous ..... 3. **N. cordifolia**
      - 4b Rachis densely hairy ..... 5. **N. exaltata**

1. **Nephrolepis acutifolia** (Desv.) Christ in Verhandlungen der Naturforschenden Gesellschaft in Basel 11: 243 (1895); Schelpe: 160 (1970); Schelpe & Diniz: 166 (1979). *Lindsaea acutifolia* Desv.: 312 (1827). Type: Habitat in insula Mauriti, sine coll. s.n. (P, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 14, fig. 1–5 (1964a).

Terrestrial, along moist evergreen forest margins, 400–600 m.

**DISTRIBUTION:** Mozambique. Also in the Madagascan region, Asia and Australia.

2. **Nephrolepis biserrata** (Sw.) Schott, Genera filicum: t. 3 (1834); Sim: 188 (1892); Sim: 125 (1915); Schelpe: 160 (1970); Schelpe: 125 (1977); Schelpe & Diniz: 164 (1979); Jacobsen: 321 (1983); Schelpe & Anthony: 167 (1986); Burrows: 204 (1990). *Aspidium biserratum* Sw.: 32 (1801). *Nephrodium biserratum* (Sw.) C.Presl: 31 (1825). *Hypopeltis biserrata* (Sw.) Bory: 65 (1833). *Lepidoneuron biserratum* (Sw.) Fée: 301 (1852b). Type: Ex insula Mauriti, Gröndal s.n. (S!, holo.).

**ILLUSTRATIONS:** Fig. 12H–J; Schelpe & Diniz: t. 12, fig. 1, 2 (1979).

Terrestrial, mainly in swampy ground and permanently moist conditions, exposed or partially shaded, near sea-level to 1 250 m.

**DISTRIBUTION:** Angola, Annobon, Benin, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Pemba, Príncipe, São Tomé, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zanzibar and Zimbabwe. Also in the Madagascan region, pantropical.

3. **Nephrolepis cordifolia** (L.) C.Presl, Tentamen pteridographiae: 79 (1836); Sim: 126 (1915). *Polypodium cordifolium* L.: 1089 (1753). Type: J. Petiver, *Pteri-graphia americana* t. 1, fig. 11 (1712), based on a plant from Hispaniola (Haiti), sine coll. s.n. The type is unsatisfactory as the plate may represent various taxa. Hispaniola, Dominican Republic, prov. de San José de Ocoa, slope of Loma del Rancho, Ekman H11627 [K, neo., proposed by Verdcourt (1996), nom. & typ. cons. (Zimmer 1999); B, LD, S, UPS, isoneo.].

*Nephrolepis undulata* (Afz. ex Sw.) J.Sm.: 37 (1846); Schelpe: 162 (1970); Schelpe: 125 (1977); Schelpe & Diniz: 167 (1979); Jacobsen: 322 (1983); Burrows: 204 (1990). *Aspidium undulatum* Afz. ex Sw.: 32 (1801). Type: Sierra Leone, Afzelius s.n. (B, holo.).

**ILLUSTRATION:** Pichi Sermolli: t. 1, fig. A–F (1978b).

Terrestrial or epilithic, rarely epiphytic, moist or seasonally dry forests and woodlands, rock outcrops, termite mounds, streambanks and seasonally moist grasslands, 900–1 675 m.

**DISTRIBUTION:** Angola, Benin, Bioko, Burundi, Cameroon, Central African Republic, Congo, Chad, Côté d'Ivoire, Democratic Republic of the Congo, Eritrea, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mali, Mozambique, Nigeria, Príncipe, Rwanda, São Tomé, Senegal, Sierra Leone, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Madagascan region, India and Thailand.

4. **Nephrolepis delicatula** (Decne.) Pic.Serm. in Webbia 23: 181 (1968a). *Nephrodium delicatulum* Decne.: 178 (1844). Type: India: in silvis umbris, ad truncos emortuos, inter Carli et Candahah, 'Voyage de V. Jacquemont aux Indes orient. 598' (P, holo.; K, iso.).

**DISTRIBUTION:** Bioko, Cameroon, Congo, Ghana, Guinea, Tanzania, Uganda and Zambia.

5. **\*Nephrolepis exaltata** (L.) Schott, Genera filicum: sub. t. 3 (1834); Sim: 125 (1915); Schelpe & Anthony: 169 (1986); Burrows: 206 (1990). *Polypodium exaltatum* L.: 1326 (1759). Type: Jamaica, Harlow sub Sloane fol. 1, 52 (BM, holo.).

**ILLUSTRATIONS:** Fig. 12K–L; Schelpe & Anthony: t. 53, fig. 1 (1986).

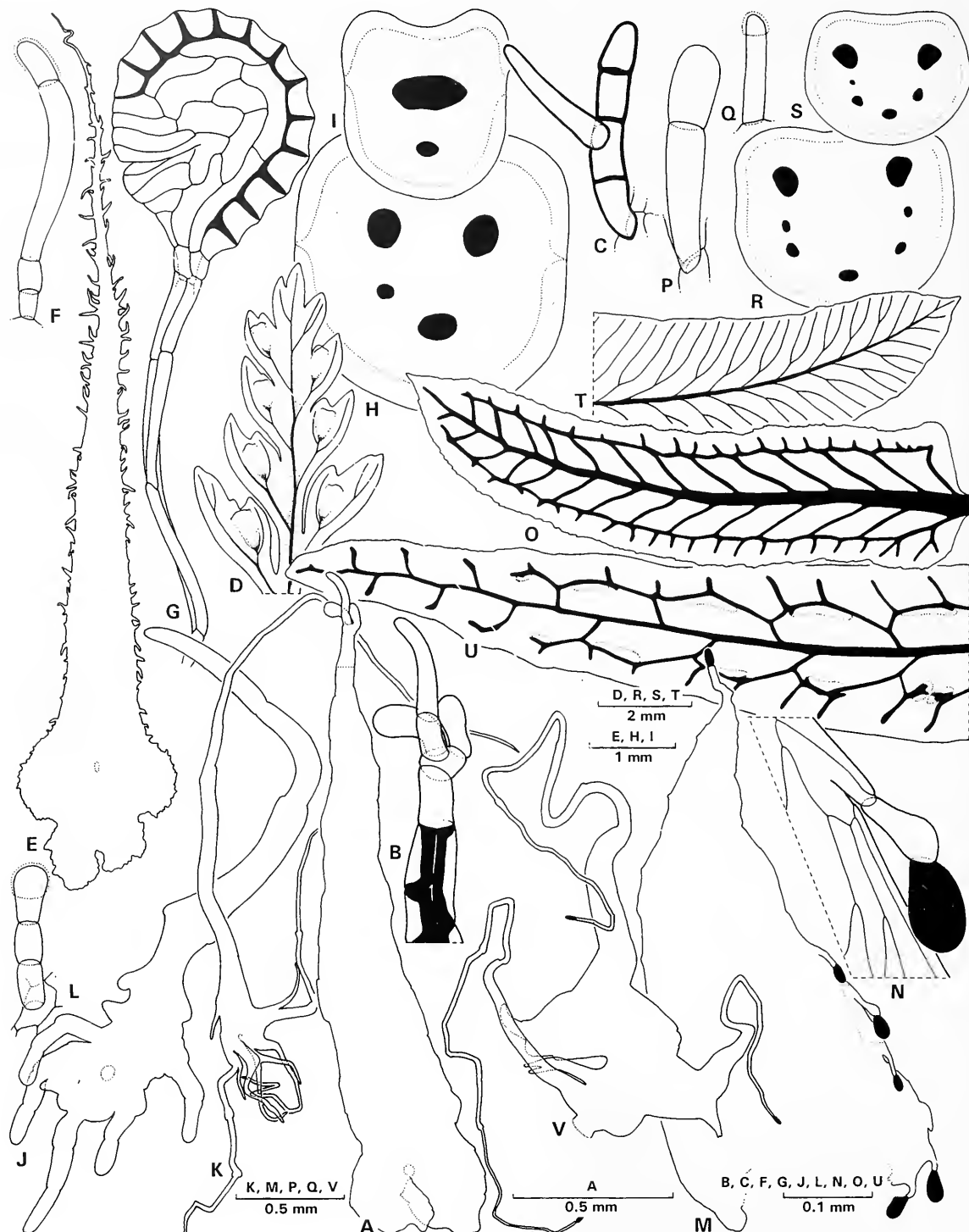


FIGURE 12A–V, Grammitidaceae, Davalliaceae, Nephrolepidaceae and Blechnaceae. A–B, *Melpomene flabelliformis*, A, rhizome palea; B, apex of A showing the cellular structure, Roux 1533 (NBG); C, *Grammitis poeppigiana*, hair from the abaxial surface of the lamina, Burrows 1527 (NBG); D–G, *Davallia denticulata* subsp. *denticulata*, D, pinnule showing the sori; E, rhizome palea; F, hair occurring abaxially along the costa; G, sporangium, Hardcastle 284 (NBG); H–J, *Nephrolepis biserrata*, H, cross section of the stipe; I, cross section of the rachis; J, palea from the adaxial surface of the lamina, Burrows 1392 (NBG); K & L, *Nephrolepis exaltata*, K, rachis palea; L, hair from the adaxial surface of the lamina, Roux 610 (NBG); M & N, *Doodia squarrosa*, M, stipe base palea; N, section of M showing the cellular structure, Van Jaarsveld 5049 (NBG); O–Q, *Blechnum australe*, O, venation of the fertile pinna, Roux 2491 (NBG); P & Q, rachis hairs, Froembling 393 (NBG); R–T, *B. attenuatum*, R, cross section of the stipe; S, cross section of the rachis; T, section of the sterile pinna showing the venation, Roux 94 (NBG); U, *B. punctulatum* var. *krebsii*, section of the fertile pinna showing the venation and position of the sori, Roux 2711 (NBG); V, *B. tabulare*, palea from the abaxial surface of the lamina, Heginbotham 327 (NBG). Scale bars: D, R, S, T, 2 mm; E, H, I, 1 mm; A, 0.5 mm; K, M, P, Q, V, 0.5 mm; B, C, F, G, J, L, N, O, U, 0.1 mm.

Terrestrial, moist or seasonally moist streambanks, roadcuttings or disturbed sites, 20–800 m.

**DISTRIBUTION:** South Africa, Swaziland, Tanzania and Zimbabwe, naturalized. Native to tropical America.

25. **THELYPTERIDACEAE** *Pic.Serm.* in *Webbia* 24: 709, 710 (1970). Type: *Thelypteris* Schmidel

Plants terrestrial or epilithic. *Rhizome* siphonostelic, solenostelic or dictyostelic, short- or wide-creeping, or suberect to erect, simple or branched; root cortex parenchymatous, with the outer cortex sclerenchymatous and the inner parenchymatous or, in *Cyclosorus* with the inner cortex parenchymatous, the outer cortex with thick-walled cells on the 2–3-cell layered parenchymatous hypodermis. *Fronds* monomorphic, caespitose or widely spaced; stipe and rachis adaxially sulcate, not open to the sulci of the lower order axes; lamina pinnately compound, of determinate or indeterminate growth, often with proliferating buds on the rachis, catadromous; hypostomatic, stomata of the anomo-, polo- and copolocytic types; venation simple or branched, free or anastomosing, often with an excurrent vein running to the sinus between two pinna lobes, ending near or in the margin, catadromous. *Indumentum* composed of narrow or broad paleae variously set with glandular and acicular trichomes occurring on the rhizome and main axes, and simple, pluricellular gland-tipped and unicellular acicular hairs occurring on the axes and lamina surfaces. *Sori* linear or circular, medial or supramedial; sporangium short- or long-stalked, stalk 3-seriate below the capsule, simple or with gland-tipped trichomes; capsule globose or broadly ellipsoidal, simple or with glandular cells or setae near the annulus; with 11–19 indurated annulus cells and a well defined stomium; exindusiate or indusiate, indusium small or large, reniform, variously set with unicellular glandular and acicular trichomes; receptacle paraphysate or not, paraphyses simple, ending in a glandular cell. *Spores* ellipsoidal, monolet, variously sculptured, 30–52 µm in length. *Gametophyte*: spore germination of *Vittaria*-type; prothallial development or the *Drynaria*-type; mature thallus epigeal, cordate or cordate-elongate, with thin midrib, wings broad and spreading, one cell layer thick, profusely hairy on both surfaces and margin, hairs elongated, acicular, non-glandular, also with unicellular, papillate, secretory hairs; antheridia first formed, 3-celled; archegonium neck 5–6 tiers high, directed towards the posterior. Chromosome number based on  $2n = 58, 70, 72, 124$ .

A family of approximately 1 000 species occurring throughout the temperate and tropical regions of the world. The generic classification for the family is diverse, some authors recognize one to three genera (Tryon & Tryon 1982b; Schelpe & Anthony 1986), whereas Smith (1990) recognizes five, Pichi Sermolli (1977b) has 32 genera, and Holttum (1971a), who is followed here, has 23. The family appears to be an old one with no apparent close relatives.

**KEY TO THE GENERA:**

- 1a Buds on the rachis give rise to new plants while still attached; some unicellular hairs on the rachis forked or branched ..... 0181000 **Ampelopteris**
- 1b Buds on the rachis, if present, mostly 1 or 2; forked or branched hairs absent:
  - 2a Costae adaxially convex; veins mostly forked, their apices not reaching the margin ..... 0182200 **Macrothelypteris**
  - 2b Costae adaxially shallowly sulcate; veins mostly simple, their apices reaching the margin:
    - 3a Veins all free, or the basal veins sometimes touching below the sinus between two pinna lobes:
      - 4a Several pairs of lower pinnae gradually reduced ..... 0182800 **Amauropelta**
      - 4b Lower pinnae abruptly much reduced or with a few pinna pairs gradually and not much reduced:
        - 5a An abrupt transition to much reduced basal pinnae:
          - 6a Reduced pinnae pairs numerous ..... 0182600 **Pseudocyclosorus**
          - 6b Reduced pinna pairs 3–6 ..... 0187600 **Christella**
        - 5b Few basal pinna pairs gradually or not reduced:
          - 7a Sori exindusiate:
            - 8a Sporangia setose; basal veins not meeting at the sinus ..... 0186700 **Stegnogramma**
            - 8b Sporangia setose; basal veins meeting below a triangular sinus-membrane ..... 0182800 **Amauropelta**
          - 7b Sori indusiate:
            - 9a Rhizome 2–3 mm in diameter; fronds almost hairless, abaxially with broad paleae on the costae ..... 0183100 **Thelypteris**
            - 9b Rhizome more than 3 mm in diameter; fronds always hairy abaxially, paleae absent ..... 0187600 **Christella**
    - 3b At least the basal pair of veins regularly anastomose with excurrent vein running to the sinus:
      - 10a Rhizome creeping; with paleae abaxially along the costa; basal pinnae not reduced ..... 0182500 **Cyclosorus**
      - 10b Rhizome short, erect or decumbent; lamina without paleae; basal pinnae variously reduced:
        - 11a Sori exindusiate:
          - 12a Venation reticulate ..... 0188000 **Menisium**
          - 12b Venation not reticulate ..... 0187300 **Pneumatopteris**
        - 11b Sori indusiate:
          - 13a Yellow and whitish capitate hairs abundant at least along the distal parts of the veins of the abaxial surface; sori confined to pinna lobes ..... 0187900 **Amphineuron**
          - 13b Yellow or whitish capitate hairs not abundant on the abaxial surface; sori not confined to the pinna lobes:
            - 14a Sporangia setose ..... 0187300 **Pneumatopteris**
            - 14b Sporangia not setose, in some cases bearing glands:
              - 15a Basal pinnae abruptly reduced ..... 0187300 **Pneumatopteris**
              - 15b Basal pinnae gradually reduced ..... 0187600 **Christella**

**0181000 AMPELOPTERIS** Kunze in *Botanische Zeitung* (Berlin) 6: 114 (1848). *Thelypteris* Schmidel subgen. *Meniscium* Schreb. sect. *Ampelopteris* (Kunze) Reed: 255 (1968). Type: *Ampelopteris elegans* Kunze (now *Ampelopteris prolifera* (Retz.) Copel.; *Hemionitis prolifera* Retz.).

Plants terrestrial. *Rhizome* siphonostelic or dictyostelic, widely creeping, branched. *Fronde*s monomorphic, approximate; stipe and rachis adaxially sulcate, sulci not open to those of the lower order axes; lamina pinnately compound, of indeterminate growth, proliferating at intervals along the rachis; hypostomatic, stomata mostly of the polo- and copolocytic types; venation catadromous, almost all anastomosing, with few residual ones running to the margin. *Indumentum* composed of small, broadly ovate paleae bearing numerous acicular trichomes along the margin and an apex that terminates in a thin-walled cell occurring along the stipe and rachis, and simple unicellular acicular hairs along the axes and lamina surfaces. *Sori* elongate, medially on veins; sporangium stalk 3-seriate below the capsule, simple or with one or two trichomes ending in a globose glandular cell; capsule globose, with 14–19 indurated annulus cells and a well defined stomium; exindusiate; receptacle with simple paraphyses terminating in a large glandular cell. *Spores* ellipsoidal, monolete, spinose, 32–50 µm long. *Gametophyte*: mature thallus cordate, often broader than long, midrib thin, with spreading wings, profusely hairy on both surfaces and the margin, hairs elongated, acicular, non-glandular, also with unicellular, papillate, secretory hairs; antheridia first formed, 3-celled, the basal cell disk- or funnel-shaped; archegonium neck slender, curved towards the posterior, the neck canal cell binucleate. Chromosome number based on  $2n = 72$ .

A monotypic genus widespread throughout the palaeotropics.

**Ampelopteris prolifera** (Retz.) Copel., *Genera filicum*: 144 (1947); Schelpe: 200 (1970); Schelpe: 160 (1977); Schelpe & Diniz: 215 (1979); Jacobsen: 398 (1983); Schelpe & Anthony: 220 (1986); Burrows: 270 (1990). *Hemionitis prolifera* Retz.: 38 (1791). *Meniscium proliferum* (Retz.) Sw.: 19, 207 (1806). *Goniopteris prolifera* (Retz.) C. Presl: 183 (1836); Sim: 192 (1892). *Nephrodium proliferum* (Retz.) Keyserl.: 49 (1873). *Dryopteris prolifera* (Retz.) C. Chr.: 286 (1905); Sim: 99 (1915). *Cyclosorus proliferus* (Retz.) Tardieu & C. Chr.: 346 (1952). Type: Habitat in India orientali, Koenig s.n. (GOET, holo.).

**ILLUSTRATIONS**: Fig. 13A; Schelpe: t. 56, fig. 1, 2 (1970).

Terrestrial, mostly in partially moist conditions along perennial streams, rivers, ponds and lakes, among sedges, riverine scrub and *Phragmites*, exposed or lightly shaded, 20–1 250 m.

**DISTRIBUTION**: Angola, Bioko, Botswana, Democratic Republic of the Congo, Guinea, Malawi, Mozambique, Senegal, South Africa, Swaziland, Tanzania, Zanzibar and Zimbabwe. Widespread throughout the palaeotropics.

**0182200 MACROTHELYPTERIS** (H. Itô) Ching in *Acta Phytotaxonomica Sinica* 8: 308 (1963). *Thelypteris* Schmidel sect. *Macrothelypteris* H. Itô: 141 (1939). *Thelypteris* Schmidel subgen. *Macrothelypteris* (H. Itô) A.R. Sm.: 233 (1976). Type: *Macrothelypteris oligophlebia* (Baker) Ching; *Nephrodium oligophlebium* Baker.

Plants terrestrial. *Rhizome* dictyostelic, short, erect to suberect. *Fronde*s caespitose, monomorphic; stipe shallowly sulcate adaxially; lamina pinnately compound; secondary rachis narrowly winged; hypostomatic, stomata of the anomo-, polo- and copolocytic types; venation free, ending near the margin. *Indumentum* composed of broadly attached paleae with marginal and superficial acicular hairs and oblong unicellular marginal glands, the apex always terminating in a large non-glandular thin-walled cell occurring on the rhizome and stipe base and acicular hairs and unicellular glands occurring on the lamina, axes and veins. *Sori* few sporangiate, medial; sporangium short-stalked, 3-seriate below the capsule, capsule globose, with 13–17 indurated annulus cells and a well defined stomium, with two oblong glandular cells near the annulus; indusium small, marginally attached, with acicular and unicellular, oblong glandular hairs marginally. *Spores* ellipsoidal, monolete, reticulate, 30–52 µm in diameter. Chromosome number based on  $2n = 124$ .

A genus of approximately nine species occurs throughout the palaeotropics (Holttum 1969).

**\*Macrothelypteris torresiana** (Gaudich.) Ching in *Acta Phytotaxonomica Sinica* 8: 310 (1963); Jacobsen: 381 (1983); Schelpe & Anthony: 219 (1986); Burrows: 272 (1990). *Polystichum torresiana* Gaudich.: 333 (1828). *Thelypteris torresiana* (Gaudich.) Alston: 111 (1960). Type: Ile Marianne, Gaudichaud s.n. (G<sup>1</sup>, holo.).

*Aspidium uliginosum* Kunze: 6 (1847). Type: Ex hort. Bonn. [LZ, holo.†; BR, lecto., designated by Morton (1973)].

**ILLUSTRATIONS**: Fig. 13B–E; Schelpe & Anthony: t. 73, fig. 1, 1a, b (1986).

Terrestrial, in permanently moist riverine forests and at the base of waterfalls, mostly partially shaded, 10–50 m.

**DISTRIBUTION**: South Africa, naturalised in various parts of KwaZulu-Natal. Native to Asia, NE Australia, Polynesia and the Madagascan region. Now also naturalized in various parts of the Americas.

**0182500 CYCLOSORUS** Link, *Hortus regius botanicus berolinensis* 2: 128 (1833b). *Dryopteris* Adans. subgen. *Cyclosorus* (Link) C. Chr.: xxi (1905). *Thelypteris* Schmidel subgen. *Cyclosorus* (Link) Morton: 153 (1963). Type: *Cyclosorus gogylodes* (Schkuhr) Link; *Aspidium gogylodes* Schkuhr, as '*goggilodus*'.

Plants terrestrial. *Rhizome* dictyostelic, wide-creeping, branched. *Fronde*s monomorphic, approximate to widely spaced; stipe and rachis adaxially sulcate, sulcus not open to the sulci of the lower order axes; lamina pinnately compound; hypostomatic, stomata of the polocytic type; venation free, simple, ending near the margin, at least the basal pair anastomose below the sinus. *Indumentum* composed of broad, dark paleae bearing unicellular thin-walled and acicular trichomes along the margin, the apex always terminating in a thin-walled cell occurring on the rhizome and stipe base, and unicellular oblong and acicular hairs occurring along the axes and veins. *Sori* circular, medial; sporangium long-stalked, 3-seriate below the capsule, with a long uniseriate trichome ending in a large globose cell on the stalk; capsule globose, with 13–16 indurated annulus cells and a well defined stomium; indusium reniform, with oblong trichomes along the margin and with acicular hairs along the margin and superficially. *Spores* ellipsoidal, monolete, 30–52 µm long. *Gametophyte*: mature thallus cordate, often broader than long, midrib thin, with spreading wings, profusely hairy on both



surfaces and the margin, hairs elongated, acicular, non-glandular, also with unicellular, papillate, secretory hairs; antheridia first formed, 3-celled, the basal cell disk- or funnel-shaped; archegonium neck slender, curved towards the posterior, the neck canal cell binucleate. Chromosome number based on  $2n = 72$ .

A genus of approximately three species with a pantropical distribution.

**Cyclosorus interruptus** (Willd.) H.Itô in Botanical Magazine (Tokyo) 51: 714 (1937), nomen tantum; Schelpe & Diniz: 214 (1979); Jacobsen: 396 (1983). *Pteris interrupta* Willd.: 13 (1794). *Thelypteris interrupta* (Willd.) K.Iwats.: 314 (1963b), nomen tantum; Schelpe: 157 (1977); Schelpe & Anthony: 209 (1986); Burrows: 259 (1990). *Aspidium obtusatum* sensu Willd.: 241 (1810). Type: Habitat in India, Klein s.n. (B-W 19770, holo.).

*Polypodium tottum* Thunb.: 172 (1800). *Thelypteris totta* (Thunb.) Schelpe: 91 (1963); Schelpe: 267 (1965); Launert: 10.2 (1969); Schelpe: 198 (1970). *Cyclosorus tottus* (Thunb.) Pic.Serm.: 173 (1968a). Type: e Cap. b. Spei, Thunberg s.n. (UPS-THUNB 24724!, holo.).

*Aspidium striatum* Schumach.: 230 (1829). *Dryopteris striata* (Schumach.) C.Chr.: 294 (1905). *Cyclosorus striatus* (Schumach.) Ching: 249 (1941c). *Thelypteris striata* (Schumach.) Schelpe: 268 (1965); Type: Guinea, sine coll. s.n. (C, holo.).

*Aspidium ecklonii* Kunze: 546 (1836). Type: In dumetis ad fluv. Zwartkopsrivier (distr. Uitenhage). *Ecklon s.n.* (LZ†, syn.); Inter Omtendo et Omsamculo in umbrosis, 400 p., 1838, Drège s.n. [LZ†; BM!, lecto., designated by Roux (1986)].

*Nephrodium unitum* sensu Sim: 178 (1892).

*Cyclosorus interruptus* as defined here is a species complex. Schelpe (1965) recognized two species whereas Holttum (1974) recognized three. Intermediates between them exist making separation on morphological grounds extremely difficult. For the sake of convenience, they are included here in a single species. Tanzanian material was found to be diploid (Manton, in Alston 1959).

**ILLUSTRATIONS:** Fig. 13F; Schelpe & Anthony: t. 70, fig. 1, 1a, b (1986).

Terrestrial, in permanently moist conditions along streams, rivers, ponds, lakes and in marshes, exposed or in riverine scrub, 20–150 m.

**DISTRIBUTION:** Algeria, Angola, Benin, Bioko, Botswana, Cameroon, Central African Republic, Chad, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Liberia, Malawi, Mozambique, Namibia, Nigeria, Pemba, Rwanda, São Tomé, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zanzibar and Zimbabwe. Also in East and West Africa and the Madagascan region.

**0182600 PSEUDOCYCLOSORUS** Ching in Acta Phytotaxonomica Sinica 8: 322 (1963) excl. *Pseudocyclosorus ciliatus* (Benth.) Ching & *P. caudipinna* Ching. Type: *Pseudocyclosorus tylodes* (Kunze) Ching; *Aspidium tylodes* Kunze, as 'xylodes'.

Plants terrestrial. *Rhizome* dictyostelic, erect. *Fronde*s monomorphic, caespitose; stipe adaxially sulcate; lamina pinnately compound, with swollen aerophores at the base of the lower pinnae; venation free, catadromous, the basal acroscopic vein terminates in the sinus between two pinna lobes, the basal basiscopic vein terminates in the margin above the sinus; hypostomatic, stomata of the anomo- and polycytic types. *Indumentum* composed of paleae, marginally and superficially with unicellular and pluricellular simple and branched hairs ending in a large thin-walled cell occurring on the rhizome and stipe base, and acicular and oblong unicellular glandular hairs occurring along the axes and lamina surfaces. *Sori* circular, medial; sporangium short-stalked, simple or with 2- or 3-celled hair ending in a swollen glandular apical cell; capsule globose, with 12–18 indurated annulus cells; indusium reniform, unequally lobed, with unicellular clavate glandular cells along the margin and superficially. *Spores* ellipsoid, monolete, gemmulate, 30–52 µm in diameter. Chromosome number based on  $2n = 70$  and 72.

A genus of approximately 12 species occurring in Africa, Asia and Japan.

**Pseudocyclosorus pulcher** (Bory ex Willd.) Holttum in Journal of South African Botany 40: 138 (1974); Jacobsen: 385 (1983). *Aspidium pulchrum* Bory ex Willd.: 253 (1810). *Nephrodium pulchrum* (Bory ex Willd.) Desv.: 256 (1827). *Lastrea pulchra* (Bory ex Willd.) C.Presl: 75 (1836). *Thelypteris pulchra* (Bory ex Willd.) Schelpe: 54 (1976); Schelpe: 151 (1977); Schelpe & Anthony: 213 (1986); Burrows: 261 (1990). Type: Réunion, Bory de St. Vincent s.n. (B-W 19787, holo.).

*Nephrodium longicuspe* Baker: 202, 203 (1877a). *Dryopteris longicuspis* (Baker) C.Chr.: 275 (1905). *Thelypteris longicuspis* (Baker) Schelpe: 262 (1965); Schelpe: 192 (1970). Type: Madagascar, neighbourhood of Antananarivo, H. Gilpin s.n. (K, holo.).

*Nephrodium zambesiaceum* Baker: 318 (1891). *Aspidium zambesiaceum* (Baker) Hieron.: 85 (1895). *Thelypteris zambesiaca* (Baker) Tardieu: 345 (1952c). Type: Zambesi Highlands, Buchanan s.n. (K, holo.).

Terrestrial, on permanently moist streambanks in forests, moderately shaded, 975–1900 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Nigeria, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

**0182800 AMAUROPelta** Kunze, Die Farnkräuter 1: 86, 109, t. 51 (1842b). *Thelypteris* Schmidel subgen. *Amauropelta* (Kunze) A.R.Sm.: 121 (1973). Type: *Amauropelta breutelii* Kunze (now *Amauropelta limbata* (Sw.) Pic.Serm.; *Aspidium limbatum* Sw.).

Plants terrestrial or epilithic. *Rhizome* dictyostelic, suberect to erect. *Fronde*s monomorphic, caespitose; stipe adaxially sulcate; lamina pinnately compound; hypostomatic, stomata of the polo- and copolycytic types; venation anadromous and catadromous, simple, the proximal pair terminating above the sinus. *Indumentum* composed of narrow paleae with superficial and marginal acicular hairs, unicellular oblong glands and unicellular globose thin-walled cells that occur marginally, the apex of the paleae always terminate in

a large thin-walled cell, the paleae are confined to the rhizome and stipe, also with acicular (often uncinata) hairs interspersed with short, few celled hairs that terminate in an obtuse cell along the axes and lamina surface. *Sori* medial along the veins, circular; sporangium short-stalked, 3-seriate below the capsule, with 11–15 indurated annulus cells; indusium subcircular, with unicellular, marginal and superficial acicular hairs, eglandular or with oblong glandular hairs. *Spores* ellipsoidal, monolete, granular, 30–52 µm in diameter. Chromosome number based on  $2n = 58$ .

A genus of approximately 200 species occurring mostly in the neotropics with a few species in Africa and the Madagascan region.

*Amauropelta* has been divided into nine sections by Smith (1974). He placed *A. bergiana* in section *Uncinella* A.R.Sm. characterized primarily by the presence of uncinata hairs and eglandular laminae and indusia.

#### KEY TO THE SECTIONS:

Hairs occurring abaxially on the lamina straight; lamina and indusia with unicellular glandular cells and oblong unicellular hairs ..... 1. sect. **Amauropelta**  
 Hairs occurring abaxially on the lamina mostly uncinata; lamina and indusia eglandular ..... 2. sect. **Uncinella**

#### 1. Section **Amauropelta**

##### KEY TO THE SPECIES:

Lamina abaxially with acicular hairs, oblong unicellular hairs and globose glandular cells ..... 1. **A. knysnaensis**  
 Lamina abaxially with acicular hairs and globose glandular cells only ..... 2. **A. oppositifomis**

1. **Amauropelta knysnaensis** (N.C.Anthony & Schelpe) Parris in Kew Bulletin 41: 70 (1986). *Thelypteris knysnaensis* N.C.Anthony & Schelpe: 155 (1982); Schelpe & Anthony: 217 (1986); Burrows: 268 (1990). Type: South Africa, George, Groeneweidebos, 200 m, 11/09/1981, C.J. Geldenhuys 609 (BOL!, holo.).

ILLUSTRATION: Burrows: t. 62, fig. 274, 274a, b (1990).

Terrestrial, in permanently moist conditions in moist evergreen forests, 50–200 m.

DISTRIBUTION: South Africa.

2. **Amauropelta oppositifomis** (C.Chr.) Holttum in Journal of South African Botany 40: 135 (1974); Jacobsen: 384 (1983). *Dryopteris oppositifomis* C.Chr.: 173, 174 (1925). *Thelypteris oppositifomis* (C.Chr.) Ching: 253 (1941c); Burrows: 270 (1990). Type: Madagascar. Région floristique du Centre. Btafo. Altitude de 1 400 mètres, 05/1914, H. Perrier de la Bâthie 7582 (P, holo.).

*Thelypteris strigosa* sensu Schelpe: 261 (1965); Schelpe: 193 (1970).

ILLUSTRATION: Tardieu-Blot: t. 21, fig. 4–6 (1953b).

Terrestrial, on moist streambanks and in montane grassveld, in light or deep shade, 700–2 300 m.

DISTRIBUTION: Cameroon, Ethiopia, Kenya, Malawi, Nigeria, South Africa, Sudan, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

2. Section **Uncinella** (A.R.Sm.) J.P.Roux, comb. nov. *Thelypteris* Schmidel subgen. *Amauropelta* (Kunze) A.R.Sm. sect. *Uncinella* A.R.Sm.: 89 (1974).

A section of approximately 50 species mostly occurs in the South and Central America.

**Amauropelta bergiana** (Schltdl.) Holttum in Journal of South African Botany 40, 2: 133 (1974); Schelpe & Diniz: 206 (1979); Jacobsen: 383 (1983). *Polypodium bergianum* Schltdl.: 20 (1825b). *Aspidium bergianum* (Schltdl.) Mett.: 363 (1858). *Lastrea bergiana* (Schltdl.) T.Moore: 86 (1858). *Nephrodium bergianum* (Schltdl.) Baker: 269 (1867a); Sim: 175 (1892). *Dryopteris bergiana* (Schltdl.) Kuntze: 812 (1891); Sim: 93 (1915). *Dryopteris prolixa* (Willd.) Kuntze var. *bergiana* (Schltdl.) Alston: 149 (1938). *Thelypteris bergiana* (Schltdl.) Ching: 251 (1941c); Schelpe: 261 (1965); Schelpe: 193 (1970); Schelpe: 150 (1977); Schelpe & Anthony: 219 (1986); Burrows: 266 (1990). Type: In sylvis Promentorii bonae spei ad Kerstenbosch, 18/02/1816, Bergius s.n. (B!, holo.).

var. **bergiana**

ILLUSTRATIONS: Fig. 13G–K; Schelpe & Anthony: t. 71, fig. 2, 2a (1986).

Terrestrial, in permanently or seasonally moist streambanks, riverine scrub, and earthbanks in forests, mostly deeply shaded, 50–2 100 m.

DISTRIBUTION: Angola, Cameroon, Kenya, Malawi, Mozambique, Nigeria, Rwanda, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. Also in East Africa and the Madagascan region.

*Amauropelta bergiana* (Schltdl.) Holttum var. *calva* Holttum occurs in West Africa and the Madagascan region, whereas var. *tristanensis* Holttum is confined to the Tristan da Cunha and Gough Island groups.

**0183100 THELYPTERIS** Schmidel, Icones plantarum et analyses partium (Ed. J.C. Keller): 3, 45, t. 11, 13 (1763), nom. cons. Type: *Acrostichum thelypteris* L. (now *Thelypteris palustris* Schott).

Plants terrestrial. *Rhizome* dictyostelic, subterranean, widely creeping, branched. *Fronde*s monomorphic, approximate to widely spaced;

stipe and rachis adaxially sulcate; lamina pinnately compound; hypostomatic, stomata of the anomocytic type; venation free, mostly forked, ending near the margin, the basal pair ending above the sinus. *Indumentum* composed of broad paleae bearing large unicellular trichomes along the margin occurring on the rhizome, stipe and abaxially along the rachis, and unicellular oblong trichomes and acicular hairs occurring on the axes. *Sori* circular, medial; sporangium short-stalked, 3-seriate below the capsule; capsule globose, with 13–15 indurated annulus cells; indusium reniform, with unicellular oblong and acicular trichomes along the margin and superficially. *Spores* ellipsoidal, monolete, gemmulate, 32–50 µm long. *Gametophyte*: mature thallus cordate, often broader than long, midrib thin, with spreading wings, profusely hairy on both surfaces and the margin, hairs unicellular, papillate, secretory; antheridia first formed, 3-celled, the basal cell disk- or funnel-shaped; archegonium neck slender, curved towards the posterior, the neck canal cell binucleate. Chromosome number based on  $2n = 70$ .

A genus of approximately three species occurring in the north and south temperate regions.

***Thelypteris confluens* (Thunb.) C.V.Morton** in Contributions from the United States National Herbarium 38: 71 (1967); Laurent: 10.2 (1969); Schelpe: 190 (1970); Schelpe & Diniz: 212 (1979); Jacobsen: 395 (1983); Schelpe & Anthony: 211 (1986); Burrows: 258 (1990). *Pteris confluens* Thunb.: 171 (1800). Type: e Cap b. Spei, *Thunberg s.n.* (UPS-THUNB 24904!, holo.).

*Aspidium thelypteris* (L.) Sw. var. *squamigerum* Schltld.: 23 (1825b). *Aspidium squamigerum* (Schltld.) Fée: 104 (1857). *Lastrea thelypteris* (L.) Bory. var. *squamigerum* (Schltld.) Bedd.: 54 (1892). *Dryopteris thelypteris* (L.) A.Gray var. *squamigera* (Schltld.) C.Chr.: 297 (1905). *Thelypteris palustris* Schott var. *squamigera* (Schltld.) Weath.: 40 (1924); Schelpe: 260 (1965). *Thelypteris squamigera* (Schltld.) Ching: 329 (1936), as '*squamulosa*'. Type: Prom. bon. Spei, 1825, *Mund s.n.* (P!, holo.).

*Nephrodium thelypteris* sensu Sim: 179 (1892).

*Dryopteris thelypteris* sensu Sim: 101 (1915).

**ILLUSTRATION:** Schelpe & Anthony: t. 71, fig. 1, 1a (1986).

Terrestrial, in marshy ground, exposed or lightly shaded, 20–1 800 m.

**DISTRIBUTION:** Angola, Botswana, Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Mozambique, namibia, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

**0186700 STEGNOGRAMMA** Blume, Enumeratio plantarum Javae 2: 172 (1828). *Gymnogramma* Desv. subgen. *Stegnogramma* (Blume) C.B.Clark: 569 (1880). *Thelypteris* Schmidl subgen. *Stegnogramma* (Blume) C.F.Reed: 254 (1968). Type: *Stegnogramma aspidioides* Blume.

Plants terrestrial or epilithic. *Rhizome* dictyostelic, suberect to erect. *Fronde* monomorphic, caespitose; stipe adaxially shallowly sulcate; lamina pinnately compound; hypostomatic, stomata of the polo- and copolocytic types; venation proximally anadromous, distally catadromous, simple, free, basal veins meeting in the sinus. *Indumentum* composed of paleae with unicellular oblong trichomes, and 3–4-celled trichomes ending in a large globose cell along the margin, as well as unicellular acicular hairs occurring along the margin and superficially on the paleae, the apex always terminate in a small thin-walled cell, occur on the rhizome and stipe base, also with short and long unicellular acicular hairs that occur along the axes and lamina surfaces, and 2–4-celled trichomes ending in a large apical cell along the axes. *Sori* linear along the veins, medial; sporangium short-stalked, 3-seriate below the capsule; capsule globose with two acicular hairs near the annulus, with 13–15 indurated annulus cells and a well defined stomium; exindusiate. *Spores* ellipsoidal, monolete, gemmulate, 32–50 µm in length. Chromosome number based on  $2n = 72$ .

A genus of approximately 15 species mostly in the palaeotropics, but with a few species in the neotropics.

***Stegnogramma pozoi* (Lag.) K.Iwats.** in Acta Phytotaxonomica Geobotanica 19: 124 (1963a); Jacobsen: 393 (1983). *Hemionitis pozoi* Lag.: 33 (1816). *Gymnogramme pozoi* (Lag.) Desv.: 216 (1827). *Pleurosorus pozoi* (Lag.) Trevis.: 256 (1875). *Ceterach pozoi* (Lag.) A.Braun ex Milde: 310 (1866). *Thelypteris pozoi* (Lag.) Morton: 234 (1959a); Schelpe: 268 (1965); Schelpe: 199 (1970); Schelpe & Anthony: 213 (1986); Burrows: 260 (1990). *Leptogramma pozoi* (Lag.) Heywood: 19 (1961). Type: Northern Spain, *D.G. del Pozo s.n.* (S-PA, holo.).

*Polypodium tottum* Willd.: 201 (1810), non Thunb. (1800). *Polypodium africanum* Desv.: 239 (1827), nom. nov. *Dryopteris africana* (Desv.) C.Chr.: 250 (1905), p.p. *Lastrea africana* (Desv.) Ching: 36 (1933a). *Leptogramma africana* Nakai ex T.Mori: 13 (1922). Type: Habitat ad Cap. b. spei, *sine coll. s.n.* (B-W 19697, holo.).

*Gymnogramma totta* Schltld.: 15 (1825a); Sim: 209 (1892). *Grammitis totta* (Schltld.) C.Presl: 209 (1836). *Leptogramma totta* (Schltld.) J.Sm.: 52 (1841b). *Phegopteris totta* (Schltld.) Mett.: 302 (1858). *Aspidium tottum* (Schltld.) Engl.: 99 (1892b). *Nephrodium tottum* (Schltld.) Diels: 170 (1899). *Dryopteris totta* (Schltld.) Masam.: 58 (1934). *Lastrea totta* (Schltld.) Ohwi: 98 (1956). Type: Crescit ad Promontorium bonae spei, *Mund & Maire s.n.* (not located).

*Dryopteris africana* sensu Sim: 102 (1915).

**ILLUSTRATIONS:** Fig. 13L–P; Tardieu-Blot: t. 36, fig. 3, 4 (1964a).

Terrestrial or epilithic, on moist streambanks, at waterfalls, and in marshy ground in moist evergreen forests, moderately to deeply shaded, 200–1 750 m.

**DISTRIBUTION:** Cameroon, Ethiopia, Kenya, Malawi, South Africa, Sudan, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region, Macaronesia and northern Spain.

**0187300 PNEUMATOPTERIS** Nakai in Botanical Magazine (Tokyo) 47: 179 (1933). Type: *Pneumatopteris callosa* (Blume) Nakai; *Aspidium callosum* Blume.

Plants terrestrial. *Rhizome* dictyostelic, widely creeping or erect. *Fronde* monomorphic, approximate or caespitose; stipe and rachis adaxially sulcate; lamina pinnately compound, with a proliferous bud on the rachis near the apex; hypostomatic, stomata of the polo- and copolycytic types; aerophores occur abaxially at the pinna base; venation simple, anastomosing, only those in the lobe apices are free and end in the margin, isodromous or catadromous. *Indumentum* composed of a few paleae confined to the rhizome and the stipe base, and acicular hairs occurring on the axes and lamina surfaces. *Sori* near costal or medial; sporangium short-stalked, 3-seriate below the capsule, with a 2- or 3-celled trichome; capsule broadly ellipsoid, with or without setae near the annulus, with 12–14 indurated annulus cells and a well defined stomium; indusiate or exindusiate, indusium glabrous or with short acicular, and 2-celled glandular hairs superficially and marginally. *Spores* ellipsoidal, monolete, irregularly winged, 30–52 µm in length. Chromosome number based on  $2n = 72$ .

A genus of approximately 70 species occurring from West Africa to Hawaii and Queensland.

#### KEY TO THE SPECIES:

- 1a *Sori* exindusiate ..... 3. **P. unita**  
 1a *Sori* indusiate:  
     2a *Rhizome* widely creeping; indusium superficially with short acicular hairs, marginally with acicular hairs and bicellular glandular hairs ..... 1. **P. afra**  
     2b *Rhizome* short creeping; indusium glabrous ..... 2. **P. prismaticus**

1. **Pneumatopteris afra** (C.Ch.) Holttum in Blumea 21: 306 (1973b). *Dryopteris afra* Christ: 107 (1908a). *Cyclosorus afer* (C.Ch.) Ching: 242 (1941c). *Thelypteris afra* (C.Ch.) Reed: 258 (1968); Schelpe: 158 (1977). Type: Congo, Haut-Oubangui, Chevalier 5799 (P, holo.; K, iso.).

**ILLUSTRATION:** Tardieu-Blot: t. 37, fig. 1–3 (1964a).

Terrestrial, in moist evergreen forests.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Côté d'Ivoire, Democratic Republic of the Congo, Ghana, Guinea, Liberia, Nigeria, Príncipe, São Tomé, Sierra Leone, Tanzania and Uganda.

2. **Pneumatopteris prismaticus** (Desv.) Holttum in Journal of South African Botany 40: 160 (1974). *Nephrodium prismaticum* Desv.: 256 (1827). *Dryopteris prismatica* (Desv.) C.Ch.: 202 (1932b). *Thelypteris prismatica* (Desv.) Schelpe: 217 (1967); Schelpe: 197 (1970). Type: Mauritius, sine coll. s.n. (P, holo.).

Terrestrial, in moist evergreen forests.

**DISTRIBUTION:** Malawi, also in Mauritius and Réunion.

3. **Pneumatopteris unita** (Kunze) Holttum in Journal of South African Botany 40: 155 (1974); Schelpe & Diniz: 216 (1979); Jacobsen: 349 (1983). *Gymnogramma unita* Kunze: 115 (1844b). *Phegopteris unita* (Kunze) Mett.: 306 (1858). *Polypodium unitum* (Kunze) Hook.: 5 (1864a), non L. (1753); Sim: 193 (1892). *Goniopteris unita* J.Sm.: 192 (1875). *Goniopteris silvatica* Pappe & Raws.: 39 (1858), nom. nov. superfl. *Dryopteris silvatica* (Pappe & Raws.) C.Ch.: 292 (1905); Sim: 100 (1915). *Cyclosorus silvaticus* (Pappe & Raws.) Ching: 249 (1941c). *Thelypteris silvatica* (Pappe & Raws.) Reed: 313 (1968). Type: In sylvis umbrosis humidissimis, inprimis ad catarractam inter Omfondi et Tagela portus Natalensis, 02–04/1842, Gueinzus s.n. (missing).

*Goniopteris madagascariensis* Fée: 251 (1852b). *Thelypteris madagascariensis* (Fée) Schelpe: 267 (1965); Schelpe: 196 (1970); Schelpe & Anthony: 209 (1986); Burrows: 262 (1990). Type: Habitat in insul, Madagascariensi, Goudot s.n. (P, holo.; G, iso.).

*Goniopteris patens* Fée: 253 (1852b). *Nephrodium patens* (Fée) J.Sm.: 208 (1875), non Desv. (1827). *Cyclosorus patens* (Fée) Copel.: 143 (1947). Type: Port Natal, Gueinzus s.n. (missing).

**ILLUSTRATION:** Fig. 13Q–S.

Terrestrial, in permanently moist conditions in forests, deeply shaded, 200–1 800 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Kenya, Malawi, Mozambique, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

**0187600 CHRISTELLA** H.Lév., Flore du Kouy-Tchéou: 472 (1915), emend. Holttum: 533 (1971b). Lectotype: *Christella parasitica* (L.) H.Lév.; *Polypodium parasitica* L., designated by Holttum (1971b).

Plants terrestrial. *Rhizome* dictyostelic, erect or short-creeping. *Fronde* monomorphic, caespitose or widely spaced; stipe and rachis shallowly sulcate adaxially, not open to the sulci of the secondary axes; lamina pinnately compound; hypostomatic, stomata of the polycytic type; venation catadromous, the basal acroscopic vein terminating in a sinus between the pinna lobes, the basicopic vein terminating in the margin above the sinus or free, the basal one or two vein pairs anastomose or connivent below the base of the sinus between two pinna-lobes. *Indumentum* composed of narrow paleae with unicellular, oblong thin-walled cells along the margin and apex, and unicellular acicular hairs on the palea surface, paleae confined to the rhizome and stipe base, unicellular acicular hairs of variable length and oblong unicellular glandular cells along the axes and lamina surfaces. *Sori* circular, medial; sporangium long-stalked, simple or with a single glandular hair near the apex; capsule globose, with 14–19 indurated annulus cells and a well defined

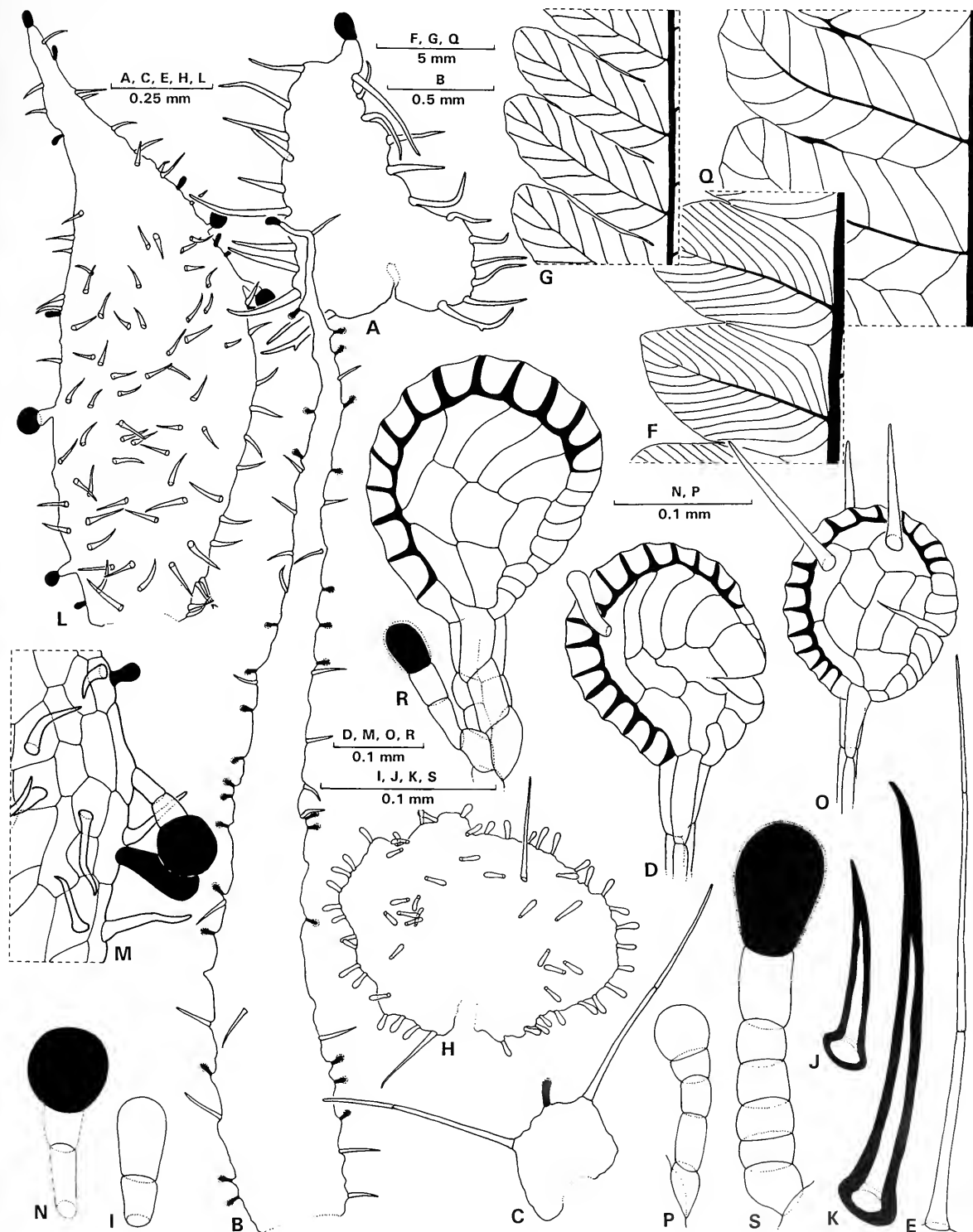


FIGURE 13A–S, Thelypteridaceae. A, *Ampelopteris prolifera*, A, rachis palea, Kluge 2274 (NBG); B–E, *Macrothelypteris torresiana*, B, stipe palea; C, indusium; D, sporangium; E, hair from the abaxial surface of the lamina, Roux 1971 (NBG); F, *Cyclosorus interruptus*, venation, Maguire 1685 (NBG); G–K, *Amauropelta bergiana* var. *bergiana*, G, venation, Roux 2588 (NBG); H, indusium, Roux 2646 (NBG); I–K, hairs from abaxial surface of the lamina, Roux 2046 (NBG); L–P, *Stegogramma pozoi*, L, stipe palea; M, section of L showing the cellular structure; N, hair from the abaxial surface of the lamina; O, sporangium; P, hair from the abaxial surface of the lamina, Roux 1965 (NBG); Q–S, *Pneumatopteris unita*, Q, venation; R, sporangium; S, hair from the abaxial surface of the lamina, Van Jaarsveld 5875 (NBG). Scale bars: F, G, Q, 5 mm; A, C, E, H, L, 0.25 mm; B, 0.5 mm; I, J, K, S, 0.1 mm; N, P, 0.1 mm; D, M, O, R, 0.1 mm.

stomium; indusium sub-circular, closely set with unicellular acicular hairs and unicellular oblong glandular cells superficially and along the margin. Spores ellipsoid, monolete, gemmulate, 30–52 µm in length. Chromosome number based on  $2n = 72$ .

A genus of approximately 110 species occurring throughout the tropical and temperate parts of the world.

#### KEY TO THE SECTIONS:

- Hairs on the sporangium stalk consist of a single elongate glandular cell; veins always anastomosing ..... 1. sect. **Christella**  
 Hairs on the sporangium stalk lacking or rare; veins all free, basal veins of adjacent groups connivent below the base of a sinus between two pinna-lobes ..... 2. sect. **Pelazoneuron**

#### 1. Section **Christella**

- 1a Rhizome erect; fronds caespitose ..... 4. **C. hispidula**  
 1b Rhizome short to widely creeping; fronds spaced:  
   2a Second acroscopic vein passing to the side of the sinus membrane; lowest 6 or more pairs of pinnae gradually reduced ..... 1. **C. altissima**  
   2b Second pair of veins run to the margin above the base of the sinus; lowest 2–4 pairs of pinnae gradually reduced:  
 3a With one pair of veins anastomosing below the sinus between pinna lobes ..... 3. **C. dentata**  
 3b With two or three pairs of veins anastomosing below the sinus between pinna lobes ..... 2. **C. buchananii**

1. **Christella altissima** *Holtum* in *Journal of South African Botany* 40: 141, 142 (1974); Jacobsen: 387 (1983). *Thelypteris altissima* (Holtum) P.J.Vorster: 260 (1977); Schelpe & Anthony: 214 (1986); Burrows: 262 (1990). Type: Natal, in a bog, *Buchanan 103b* (K!, hol.; W!, iso.).

Terrestrial, in moist conditions, marshy ground in riverine scrub, light to deeply shaded, 20–800 m.

**DISTRIBUTION:** South Africa.

2. **Christella buchananii** (Schelpe) J.P.Roux, *comb. et stat. nov.* *Thelypteris dentata* (Forssk.) E.P.St.John var. *buchananii* Schelpe: 265 (1965), p.p.; Schelpe: 198 (1970); Jacobsen: 389 (1983); Burrows: 264 (1990). Type: Mozambique, Manica & Sofala, Garuso. 'Jagersberg' (Bandula Mountain), locally frequent on streambank in forest, 2 600 ft, 11/07/1955, *Schelpe 5599* (BOL!, hol., 2 sheets).

**ILLUSTRATION:** Schelpe: t. 1, fig. d (1965).

Terrestrial, deeply shaded moist streambanks in evergreen forests, 350–950 m.

**DISTRIBUTION:** Mozambique, South Africa and Zimbabwe.

3. **Christella dentata** (Forssk.) Brownsey & Jermy in *British Fern Gazette* 10: 338 (1973); Schelpe & Diniz: 209 (1979); Jacobsen: 388 (1983). *Polypodium dentatum* Forssk.: 185 (1775). *Dryopteris dentata* (Forssk.) C.Chr.: 24 (1920). *Thelypteris dentata* (Forssk.) E.P.St.John: 44 (1936); Schelpe: 265 (1965); Schelpe: 197 (1970); Schelpe: 152 (1977); Schelpe & Anthony: 215 (1986). *Cyclosorus dentatus* Ching: 206 (1938a). Type: Sum priore in montibus Yemen ad Bolghose, 1763, *Forsskål 809* (C!, ?lecto.).

*Nephrodium hispidulum* A.Peter: 40, 1: 58, Descr. 10, t. 4a, b (1929). Type: Rhodesia, *Peter s.n.* (B, hol.).

**ILLUSTRATION:** Schelpe & Anthony: t. 72, fig. 1, 1a, b (1986).

Terrestrial, in moist riverine forests and on shady streambanks, moderately to deeply shaded, 20–1 600 m.

**DISTRIBUTION:** Angola, Benin, Cameroon, Coté d'Ivoire, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Pemba, Rwanda, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, Zanzibar and Zimbabwe. Pantropical.

4. **Christella hispidula** (Decne.) *Holtum* in *Kew Bulletin* 31: 312 (1976); Schelpe & Diniz: 208 (1979). *Aspidium hispidulum* Decne.: 346 (1834). *Thelypteris hispidula* (Decne.) Reed: 238 (1968); Schelpe: 152 (1977); Jacobsen: 387 (1983); Burrows: 264 (1990). Type: Timor, *Guichenot s.n.* (P, hol.).

*Christella hilsenbergii* (C.Presl) *Holtum*: 142 (1974); Jacobsen: 387 (1983). *Nephrodium hilsenbergii* C.Presl: 47 (1851). Type: Mauritius, *Sieber 49* (PRC, hol.; K, P, iso.).

*Nephrodium quadrangulare* Fée: 308 (1852b). *Dryopteris quadrangularis* (Fée) Alston: 253 (1937). *Cyclosorus quadrangularis* (Fée) Tardieu: 345 (1953a). *Thelypteris quadrangularis* (Fée) Schelpe: 196 (1964); Schelpe: 195 (1970). Type: Habitat in Guyana, gallic., in sylvis paludosis ad ripas amnis Mont-Tigre, *Leprieur 182* (?P, hol.; NY, iso.).

**ILLUSTRATION:** Schelpe: t. 1, fig. b (1964).

Terrestrial, on moist floors of deeply shaded evergreen forests, 400–1 500 m.

**DISTRIBUTION:** Angola, Bioko, Coté d'Ivoire, Ghana, Kenya, Liberia, Malawi, Mozambique, Nigeria, Sierra Leone, South Africa, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region and tropical Asia and America.

2. Section **Pelazoneuron** *Holtum* in *Journal of South African Botany* 40: 144 (1974). Type: *Christella patens* (Sw.) *Holtum*; *Polypodium patens* Sw.

## KEY TO THE SPECIES:

- 1a With 1–6 pairs of very small reduced pinnae at the base of the frond:  
 2a Lamina between the veins on both surfaces glabrous ..... 4. **C. guineensis**  
 2b Lamina abaxially between the veins with acicular and capitate hairs ..... 2. **C. friesii**
- 1b With one or more pairs of the lower pinnae gradually reduced:  
 3a Lamina abaxially and indusia with copious yellowish capitate hairs and few acicular hairs ..... 5. **C. microbasis**  
 3b Lamina abaxially with copious acicular and capitate hairs:  
 4a Rhizome erect; indusium with acicular and capitate glandular hairs; sporangium stalk with unicellular glandular hairs ..... 3. **C. gueinziana**  
 4b Rhizome decumbent; indusium with few acicular hairs and copious glandular hairs; sporangium stalk eglandular ..... 1. **C. chaseana**

1. **Christella chaseana** (Schelpe) Holttum in Journal of South African Botany 40: 148 (1974); Schelpe & Diniz: 211 (1979); Jacobsen: 392 (1983). *Thelypteris chaseana* Schelpe: 263 (1965); Launert: 10.1 (1969); Schelpe: 194 (1970); Schelpe: 155 (1977); Schelpe & Anthony: 215 (1986); Burrows: 265 (1990). *Lastrea chaseana* (Schelpe) Pic.Serm.: 175 (1968a). Type: South West Africa, Otjiwarongo District. Grosse Waterberg above Waterberg Station, locally common along perennial stream in bush in shade on south aspect, 5 200 ft, 14/07/1954, Schelpe 4791 (BOL!, holo., 3 sheets; BM!, iso.).

ILLUSTRATION: Schelpe: t. 1, fig. F (1965).

Terrestrial, in wet riverine and swamp forests, moderately to deeply shaded, 750–1 800 m.

DISTRIBUTION: Angola, Cameroon, Ethiopia, Kenya, Malawi, Mozambique, Namibia, South Africa, Tanzania, Uganda, Zambia and Zimbabwe.

2. **Christella friesii** (Brause) Holttum in Journal of South African Botany 40: 145 (1974); Jacobsen: 389 (1983). *Dryopteris friesii* Brause: 1 (1914). *Thelypteris friesii* (Brause) Schelpe: 216 (1967); Schelpe: 192 (1970); Burrows: 260 (1990). Type: Nordost-Rhodesia: Luvigo, in dichtem Wald auf feuchten Boden, R.E. Fries 1104 (UPS, holo.).

Terrestrial, in wet riverine and swamp forests, moderately to deeply shaded, 1 100–1 700 m.

DISTRIBUTION: Angola, Cameroon, Democratic Republic of the Congo, Kenya, Malawi, Tanzania, Zambia and Zimbabwe.

3. **Christella gueinziana** (Mett.) Holttum in Journal of South African Botany 40: 147 (1974); Schelpe & Diniz: 210 (1979); Jacobsen: 391 (1983). *Aspidium gueintzianum* Mett.: 367, 368 (1858). *Lastrea gueintziana* T.Moore: 93 (1858). *Nephrodium gueintziana* (Mett.) Hieron.: 341 (1900b). *Dryopteris gueintziana* (Mett.) C.Chr.: 269 (1905). *Thelypteris gueinziana* (Mett.) Schelpe: 262–264 (1965); Schelpe: 194 (1970); Schelpe: 154 (1977); Schelpe & Anthony: 217 (1986). Type: Prom. b. spei, Port Natal, *Gueinzia* s.n. (B!, holo.).

ILLUSTRATION: Schelpe: t. 1, fig. A (1965).

Terrestrial or epilithic, along streambanks and riverbanks in forests, riverine scrub and woodlands, moderately to deeply shaded, 20–1 900 m.

DISTRIBUTION: Angola, Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Mozambique, South Africa, Sudan, Swaziland, Tanzania, Zambia and Zimbabwe. Also in the Madagscan region.

4. **Christella guineensis** (Christ) Holttum in Journal of South African Botany 40: 145 (1974). *Dryopteris guineensis* Christ: 22 (1909b). *Thelypteris guineensis* (Christ) Alston: 48 (1952); Schelpe: 153 (1977). Type: Guinea, Labé, Chevalier 12385 (P, holo.).

DISTRIBUTION: Angola, Guinea and Zambia.

5. **Christella microbasis** (Baker) Holttum in Journal of South African Botany 40: 146 (1974). *Nephrodium microbasis* Baker: 496 (1874a). *Dryopteris microbasis* (Baker) Kuntze: 813 (1891). *Thelypteris microbasis* (Baker) Tardieu: 117 (1953b); Schelpe: 154 (1977); Burrows: 265 (1990). *Lastrea microbasis* (Baker) Pic.Serm.: 175 (1968a). Type: Nigeria, Barter s.n. (K, holo.).

ILLUSTRATION: Tardieu-Blot: t. 20, fig. 1–4 (1953b).

Terrestrial, along streambanks in forested kloofs, moderately to deeply shaded, 200–1 500 m.

DISTRIBUTION: Angola, Benin, Cameroon, Côté d'Ivoire, Ghana, Guinea, Liberia, Mali, Nigeria and Zimbabwe.

**0187900 AMPHINEURON** Holttum, Blumea 19: 45, fig. 19, 19a (1971a). Type: *Amphineuron opulentum* (Kaulf.) Holttum; *Aspidium opulentum* Kaulf.

Plants terrestrial. *Rhizome* solenostelic, short-creeping. *Fronds* monomorphic, approximate; stipe and rachis adaxially shallowly sulcate, not open to the sulci of the lower order axes; lamina pinnately compound; venation simple, free, the basal pair passing the sides of the sinus-membrane or anastomose below it, then with a short excurrent vein. *Indumentum* composed of paleae occurring on the rhizome and stipe base and acicular and capitate hairs occurring on the axes and lamina surfaces. *Sori* confined to the lobes, supramedial; sporangium stalk 3-seriate below the capsule, with a hair several cells long and ending in a spherical glandular cell; capsule broadly ellipsoidal; indusium with unicellular glandular cells along the margin. *Spores* ellipsoidal, monolete, 32–50 µm long. Chromosome number based on  $2n = 72$ .

A genus of approximately 15 species mostly in Malaysia, but with two widely distributed species in Africa.

**Amphineuron opulentum** (Kaulf.) Holttum in Blumea 19: 45 (1971a); Schelpe & Diniz: 218 (1979); Jacobsen: 401 (1983). *Aspidium opulentum* Kaulf.: 238 (1824). *Thelypteris opulenta* (Kaulf.) Fosberg: 3 (1972), excl. syn. *Nephrodium terminans* Wall. Type: Habitat in Guahan, Chamisso s.n. (LE, holo.).

*Aspidium extensum* Blume: 156 (1828). *Nephrodium extensum* (Blume) T.Moore: 91 (1858). *Dryopteris extensa* (Blume) Kuntze: 812 (1891). *Cyclosorus extensus* (Blume) Ching: 182 (1938a). *Thelypteris extensa* (Blume) C.V.Morton: 113 (1959b); Schelpe: 195 (1970). Type: Pulo Pinang, Blume s.n. (L, holo.).

Terrestrial, mostly in moist evergreen forests, 200–400 m.

**DISTRIBUTION:** Kenya, Mozambique, Pemba and Tanzania. Also in the Madagascan region, tropical Asia, Malaysia and the Pacific.

**0188000 MENISORUS** Alston in Boletim da Sociedade Broteriana, Sér. 2, 30: 20 (1956a). Type: *Menisorus pauciflorus* (Hook.) Alston; *Meniscium pauciflorum* Hook.

Plants terrestrial or epilithic. *Rhizome* dictyostelic, erect. *Fronds* monomorphic, caespitose; stipe and rachis adaxially sulcate; lamina pinnately compound, proliferous near the apex; hypostomatic, stomata of the anomo- and polocytic types; veins anastomosing. *Indumentum* composed of sessile, broadly-ovate paleae, the margins sparsely set with unicellular clavate gland-like cells, the apex terminating in an oblong thin-walled, apparently glandular cell occurring on the rhizome, stipe and abaxially along the costae. *Sori* medial along the first pair of veins; sporangium stalk simple, 3-seriate below the capsule; capsule globose, with 11–18 indurated annulus cells and a well defined stomium; exindusiate. *Spores* ellipsoidal, monolete, gemmulate, 32–50 µm in diameter. Chromosome number unknown.

A monotypic genus widely distributed throughout Africa.

**Menisorus pauciflorus** (Hook.) Alston in Boletim da Sociedade Broteriana, Sér. 2, 30: 20 (1956a); Schelpe: 160 (1977). *Meniscium pauciflorum* Hook.: 164 (1864b). *Phegopteris pauciflora* (Hook.) Mett. ex Kuhn: 123 (1868). *Dryopteris pauciflora* (Hook.) C.Chr.: 283 (1905). *Cyclosorus pauciflorus* (Hook.) Ching: 247 (1941c). *Thelypteris pauciflora* (Hook.) Reed: 302 (1968). Type: Cameroons, Sierra del Crystal, G. Mann 1672 (K, holo.).

**ILLUSTRATION:** Schelpe: t. 27, fig. 1, 2 (1977).

**DISTRIBUTION:** Angola, Cameroon, Nigeria, Tanzania and Uganda.

**DRYOPTERIDACEAE** Ching in Acta Phytotaxonomica Sinica 10: 1 (1965), nom. cons. Type: *Dryopteris* Adans.

*Aspidiaceae* Mett. ex Frank: 1469 (1877), nom. illeg. Type: *Aspidium* Sw.

Plants terrestrial, epilithic or low-level epiphytes. *Rhizome* dictyostelic, creeping, short-decumbent, suberect or erect, often laterally branched, often stoloniferous; roots with an outer parenchymatous cortex and a sclerenchymatous inner cortex, often with passage cells. *Fronds* monomorphic or dimorphic, caespitose or widely spaced; stipe and rachis adaxially sulcate, open or closed to the sulci of the lower order axes, with a central ridge in *Rumohra*, with two larger circular vascular bundles dorsally and two or more smaller ones ventrally; lamina pinnately compound, anadromous and/or catadromous, the basal pinna pair often basiscopically developed; hypostomatic, stomata of the anomo-, polo- and copolocytic types; aerophores in dorso-lateral lines along the axes; venation simple, forked or pinnately branched, free or anastomosing, with or without included veinlets, mostly ending near the margin, anadromous and/or catadromous. *Indumentum* composed of broadly attached to cordate-imbricate, unistratose or proximally multistratose paleae with or without marginal and superficial indument occurring on the rhizome, axes and lamina, also with capitate or cylindrical unicellular glands, uniseriate cylindrical or capitate hairs occurring along the axes and lamina surfaces. *Sori* circular or elongate, dorsal or at the vein endings, often on an abbreviated vein; sporangium short- or long-stalked, stalk simple or with trichomes, 3-seriate below the capsule; capsule globose, with 12–24 indurated annulus cells and a well defined stomium; indusium reniform or peltate or exindusiate; receptacle with few 2- and 3-celled paraphyses or not. *Spores* ellipsoidal, monolete, echinate, tuberculate or with narrow wing-like folds, to 27–70 µm long. *Gametophyte*: spore germination of the *Vittaria*-type; germ filament terminating in a hair; prothallial development of the *Aspidium*-type; mature thallus cordate, symmetrical, generally broader than long, with a distinct midrib and spreading wings, glabrous or profusely hairy, hairs unicellular, secretory; antheridium 3-celled, the basal cell funnel-shaped, dehiscing by the collapse of the cap cell; archegonium neck with 4–6 tiers of cells, curved towards the posterior, the neck canal cell binucleate, swollen towards the apex. Chromosome number based on  $2n = 82, 123, 164$  or  $328$ ; apogamy reported.

A family with a near cosmopolitan distribution. The dryopteridoid ferns are characterized by three or more vascular bundles in the stipe. The chromosome number in the family is based on  $n = 41$ . Bower (1928) postulated the family as having derived from a cyathoid ancestor, whereas Holttum (1947) proposed a dennstaedtioid ancestor. The studies of Hasebe *et al.* (1995) and Pryer *et al.* (1995) showed that both these families are basal to the Dryopteridaceae. Their studies also suggest that *Rumohra* be placed with *Elaphoglossum* in the Lomariopsidaceae. Kramer (1990b) placed *Rumohra* in the monotypic tribe Rumohreae, a subdivision not validly published.

#### KEY TO THE GENERA:

- 1a Indusium mostly circular, conspicuously peltate, rarely exindusiate:
  - 2a Sulci of the lower order axes with a central ridge ..... 0190000 **Rumohra**
  - 2b Sulci of the lower order axes without a central ridge:
    - 3a Venation free, pinnately branched ..... 0190900 **Polystichum**
    - 3b Venation anastomosing, areoles with excurrent included veinlets ..... 0191600 **Cyrtomium**
- 1b Indusium elongate or reniform, centrally or marginally attached, rarely exindusiate:
  - 4a Sori oval with a centrally attached elongated indusium ..... 0191100 **Didymochlaena**



4b Sori circular with a reniform, marginally attached indusium or rarely exindusiate:

5a Lamina hairs multistratose at the base ..... 0190400 **Nothoperanema**

5b Lamina hairs (if present) unistratose at the base:

6a Lamina abaxially with short and long, mostly simple uniseriate trichomes along the veins or if absent then the lamina not basiscopically developed ..... 0190500 **Dryopteris**

6b Lamina abaxially with narrow paleae along the veins, the lamina basiscopically developed ..... 0190600 **Arachniodes**

**0190000 RUMOHRA** *Raddi*, *Opuscoli scientifici* 3: 290, t. 12, fig. 1 (1819). Type: *Rumohra aspidioides* Raddi, (now *Rumohra adiantiformis* (G.Forst.) Ching; *Polypodium adiantiforme* G.Forst.).

Plants terrestrial, epilithic or low-level epiphytes. *Rhizome* a dorsiventral dictyostele, long-creeping, laterally branched. *Fronde*s monomorphic, approximate or widely spaced, in two dorsal rows; stipe and rachis adaxially sulcate with a raised centre; lamina pinnately compound, the basal pinnae basiscopically developed; hypostomatic, stomata of the anomocytic type; venation anadromous, free, forked, almost reaching the margin. *Indumentum* composed of narrow and broad paleae often bearing unicellular glandular cells along the margin, the apex always terminating in a small non-glandular oblong cell, occurring on the rhizome, axes and costae. Sori circular, large, dorsal or terminal, mostly on the anadromous vein branches, in two rows flanking the costae and costules; sporangium stalk long, simple, 2-seriate but 3-seriate below the capsule; capsule obovoid, with 13–14 indurated annulus cells and a well defined stomium; indusium peltate, circular, adaxially and abaxially with ovoid, unicellular glands, entire; receptacle with a few unicellular glandular trichomes. *Spores* ellipsoidal, monolete, with prominent folds and tubercles, 30–38 µm in length. Chromosome number based on  $2n = 82$ .

A genus of approximately five species with a circum-austral distribution.

***Rumohra adiantiformis*** (G.Forst.) Ching in *Sinensia* 5: 70 (1934a); Jacobsen: 457 (1983); Schelpe & Anthony: 261 (1986); Burrows: 320 (1990). *Polypodium adiantiforme* G.Forst.: 82 (1786). *Polystichum adiantiforme* (G.Forst.) J.Sm.: 220 (1875). *Dryopteris adiantiformis* (G.Forst.) Kuntze: 378 (1898). Type: New Zealand, *Forster s.n.* (BM!, holo.; UPS, iso.).

*Aspidium capense* Willd.: 267 (1810), non Sw. (1801); Sim: 168 (1892). Type: Habitat ad Cap. b. spei, *sine coll. s.n.* (B-W 19803.1, holo.).

**ILLUSTRATIONS:** Fig. 14A & B; Schelpe & Anthony: t. 90, fig. 1, 1a (1986).

Terrestrial, epilithic or low-level epiphytes, in moist forests and seasonally dry rock crevices in montane regions, exposed or deeply shaded, 20–100 m.

**DISTRIBUTION:** South Africa and Zimbabwe. Also in the Madagascan region, circum-austral.

**0190400 NOTHOPERANEMA** (*Tagawa*) Ching in *Acta Phytotaxonomica Sinica* 11: 25 (1966). *Dryopteris* Adans. subgen. *Nothoperanema* Tagawa: 199 (1938b). Type: *Nothoperanema squamiseta* (Hook.) Ching; *Nephrodium squamiseta* Hook.

Plants terrestrial or epilithic. *Rhizome* dictyostelic, suberect to erect. *Fronde*s monomorphic, caespitose; stipe and rachis adaxially sulcate; lamina pinnately compound, the basal pinna pair basiscopically developed; hypostomatic, stomata of the anomo- and polocytic types; venation free, forked or pinnately branched, ending well behind the margin, anadromous or catadromous. *Indumentum* composed of broadly attached, basally multistratose paleae occurring on the rhizome, axes and adaxially on the lamina veins, and clavate, unicellular glandular cells and simple uniseriate trichomes abaxially along the veins. Sori circular, dorsally on the veins; sporangium long-stalked, 3-seriate below the capsule, simple or bearing a long uniseriate trichome; capsule globose, with 13–17 indurated annulus cells and a well defined stomium; indusium reniform, entire, adaxially with numerous unicellular, clavate trichomes. *Spores* ellipsoidal, monolete, with prominent folds, tuberculate, 27–40 µm in length. Chromosome number based on  $2n = 82$ .

A genus of five species occurring in northern India, southern China, Taiwan, South Africa and the Madagascan region.

***Nothoperanema squamiseta*** (Hook.) Ching in *Acta Phytotaxonomica Sinica* 11: 25 (1966). *Nephrodium squamiseta* Hook.: 140 (1862a). *Aspidium squamiseta* (Hook.) Kuhn: 24 (1867). *Dryopteris squamiseta* (Hook.) Kuntze: 813 (1891); Schelpe: 223 (1970); Jacobsen: 440 (1983); Schelpe & Anthony: 245 (1986); Burrows: 306 (1990). Type: Fernando Po, Clarence Peak, G. Mann 380 (K, holo.).

*Nephrodium buchananii* Baker: 498 (1874a); Sim: 184 (1892). *Lastrea buchananii* (Baker) Bedd.: 255 (1883). *Dryopteris buchananii* (Baker) Kuntze: 812 (1891); Sim: 108 (1915). Type: Natal, *Buchanan 108* (K!, holo.).

**ILLUSTRATIONS:** Fig. 14C & D; Burrows: t. 72, fig. 312, 312a (1990).

Terrestrial, in wet conditions in moist evergreen forests, deeply shaded, 700–2000 m.

**DISTRIBUTION:** Bioko, Cameroon, Kenya, Malawi, Rwanda, Somalia, South Africa, Sudan, Swaziland, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region and Southeast Asia.

**0190500 DRYOPTERIS** *Adans.*, *Familles des plantes* 2: 20, 551 (1763), nom. cons. Type: *Dryopteris filix-mas* (L.) Schott; *Polypodium filix-mas* L.

*Nephrodium* Michx.: 266 (1803). Type: *Nephrodium marginale* (L.) Michx.; *Polypodium marginale* L. (now *Dryopteris marginalis* (L.) A.Gray).

Plants terrestrial or epilithic. *Rhizome* dictyostelic, short-decumbent and branched, or suberect to erect. *Fronde*s monomorphic or dimorphic,

approximate or caespitose; stipe and rachis adaxially sulcate, not open to the sulci of the lower order axes; lamina pinnately compound, mostly catadromous, the basal pinna pair often basiscopically developed; hypostomatic, stomata of the polo- and copolocytic types; venation free, forked or pinnately branched, ending near the margin, anadromous and/or catadromous. *Indumentum* composed of narrow and/or broad paleae often bearing clavate, unicellular thin-walled cells along the margin occurring on the rhizome, axes and abaxially on the lamina, and clavate, unicellular glandular cells and short or long, simple or glandular, uniseriate trichomes mostly abaxially along the lamina veins. *Sori* circular, medial, dorsally or at the vein endings; sporangium long-stalked, 3-seriate below the capsule, stalk simple or bearing one or more uniseriate simple trichomes; capsule globose to obovoid, with 13–20 indurated annulus cells and a well defined stomium; indusiate or exindusiate, indusium reniform, simple or with unicellular clavate cells along the margin. *Spores* ellipsoidal, monolete, with prominent folds and inflated tubercles, 20–70 µm long. *Gametophyte*: mature thallus cordate, symmetrical, generally broader than long, with a distinct midrib and spreading wings, profusely hairy, hairs unicellular, secretory; antheridium 3-celled, the basal cell funnel-shaped, dehiscence by the collapse of the cap cell; archegonium neck with 4–5 tiers of cells, curved towards the posterior, the neck canal cell binucleate, swollen towards the apex; apogamy reported. Chromosome number based on  $2n = 82$ .

A genus of approximately 255 species with a near cosmopolitan distribution. Following the classification of Fraser-Jenkins (1986), the genus is divided into four subgenera of which two occur in southern Africa. The subgenera and sections are not clearly defined.

**KEY TO THE SUBGENERA:**

- Stipe paleae restricted to the stipe base ..... 1. subgen. **Nephrocystis**
- Stipe paleae not restricted to the stipe base ..... 2. subgen. **Dryopteris**

1. Subgenus **Nephrocystis** (H.Itô) Fraser-Jenk. in Bulletin of the British Museum (Natural History), Botany 14: 197 (1986). *Dryopteris* Adans. sect. *Nephrocystis* H.Itô: 437 (1935). Type: *Dryopteris hayatae* Tag. (now *Dryopteris subexaltata* (Christ) C.Chr.; *Aspidium subexaltatum* Christ).

Section **Purpurascens** Fraser-Jenk. in Bulletin of the British Museum (Natural History), Botany 14: 197 (1986). Type: *Dryopteris purpurascens* (Blume) Christ; *Aspidium purpurascens* Blume.

**Dryopteris kilemensis** (Kuhn) Kuntze, Revisio generum plantarum 2: 813 (1891), as '*kilmensis*'; Schelpe: 222 (1970); Schelpe & Diniz: 239 (1979); Jacobsen: 438 (1983); Burrows: 303 (1990). *Aspidium kilemense* Kuhn: 24 (1867), as '*kilemensis*'. *Nephrodium kilemense* (Kuhn) Baker: 498 (1874a). Type: In Kilima ad radices montis Kilimandjaro regionis Dschagga, 3–4 000 ped., 1864, Kersten 46 (B 51628, holo.).

*Nephrodium lastii* Baker: 324 (1891). *Aspidium lastii* (Baker) Hieron.: 85 (1895). *Dryopteris lastii* (Baker) C.Chr.: 274 (1905). Type: Mozambique, Last s.n. (K!, holo.).

**ILLUSTRATIONS:** Fig. 14H; Burrows: t. 71, fig. 308, 308a, b (1990).

Terrestrial, on moist evergreen forests floors, deeply shaded, 1 550–2 350 m.

**DISTRIBUTION:** Burundi, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zambia and Zimbabwe.

2. Subgenus **Dryopteris**

Eleven sections are recognized in this subgenus, four of them occurring in southern Africa.

**KEY TO THE SECTIONS:**

- 1a Sori occurring at the apices of abbreviated vein branches ..... 4. sect. **Lophodium**
- 1b Sori occurring dorsally on unabbreviated vein branches:
  - 2a Lamina 1-pinnate ..... 1. sect. **Fibrillosae**
  - 2b Lamina 2- to 3-pinnate:
    - 3a Basal pinnae conspicuously basiscopically developed ..... 2. sect. **Marginatae**
    - 3b Basal pinnae not conspicuously basiscopically developed ..... 3. sect. **Cinnamomeae**

1. Section **Fibrillosae** Ching in Bulletin of the Fan Memorial Institute of Biology 8: 366 (1938b). Type: *Dryopteris fibrillosa* (C.B.Clarke) Hand.-Mazz., non (Baker) C.Chr. (1905); *Nephrodium filix-mas* (L.) Rich. var. *fibrillosa* C.B.Clarke (now *Dryopteris pulcherrima* Ching).

**Dryopteris wallichiana** (Spreng.) Hyl. in Botaniska Notiser 1953: 352 (1953); Schelpe: 225 (1970); Jacobsen: 441 (1983); Burrows: 308 (1990). *Aspidium wallichianum* Spreng.: 104 (1827). Type: Nepal (not located).

**ILLUSTRATION:** Burrows: t. 72, fig. 313, 313a (1990).

Terrestrial, in moist conditions in montane environments, lightly shaded, 1 980 m.

**DISTRIBUTION:** Zimbabwe. Also in the Madagascan region, Asia and the mid-Atlantic island groups.

2. Section **Marginatae** Fraser-Jenk. in Bulletin of the British Museum (Natural History), Botany 14: 194 (1986). Type: *Dryopteris marginata* (Wall. ex C.B.Clarke) Christ; *Aspidium marginatum* Wall. ex C.B.Clarke.

**KEY TO THE SPECIES:**

- 1a Fronds dimorphic, the fertile longer than the sterile ..... 2. **D. dracomontana**
- 1b Fronds monomorphic, the sterile and fertile fronds are of equal length:
  - 2a Fronds with a proliferating bud on the rachis near the lamina apex ..... 4. **D. manniana**

2b Fronds without proliferating buds on the lamina:

- 3a Basal pinna pair markedly reduced; rhizome creeping, to 12 mm in diameter ..... 3. *D. inaequalis*  
 3b Basal pinna pair never reduced; rhizome erect or decumbent, generally more than 12 mm in diameter:  
 4a Rhizome stout, erect, mostly unbranched ..... 6. *D. schimperiana*  
 4b Rhizome decumbent, branched:  
 5a Lamina abaxially without, or with oblong unicellular glandular hairs, hairs 65–140 µm long,  
 2-celled hairs absent; stomata 36–46 µm long ..... 1. *D. lewalleana*  
 5b Lamina abaxially with oblong unicellular glandular hairs, hairs 98–207 µm long, 2-celled hairs present;  
 stomata 44–70 µm long ..... 5. *D. pentheri*

1. *Dryopteris lewalleana* Pic.Serm. in Bulletin du Jardin Botanique National de Belgique 55: 158–162, fig. 3 (1985b). Type: Burundi, Prov. Bujumbura, route de Mwisare. 1050 m, talus humide, 8 Apr. 1971, *Lewalle 5482* (PIC.SERM. 26049, holo.; BR!, PIC.SERM. iso.).

*Lastrea pentagona* T.Moore: 227 (1853); Pappe & Rawson: 13 (1858). *Aspidium pentagonum* (T.Moore) Kuhn: 139 (1868). Type: Natal, Umvoti, in ravines and wet places, 1853, *A.W. Plant 325* (K!, holo., 2 sheets).

*Dryopteris inaequalis* (Schltdl.) Kuntze var. *atropaleacea* Schelpe: 213 (1967). Type: Tanganyika, Sumbawanga, Mbisi, Ufipa, Mbisi forest, 7 500 ft, 18/01/1958, *Vesey-Fitzgerald 1390* (BOL!, holo.).

Terrestrial, in seasonally moist conditions among rocks, along streams and in forests, exposed or deeply shaded, 300–2 600 m.

**DISTRIBUTION:** Burundi, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, South Africa, Swaziland, Uganda and Zimbabwe

2. *Dryopteris dracomontana* Schelpe & N.C.Anthony in Contributions from the Bolus Herbarium 10: 147 (1982), nom. nov. for *Aspidium inaequale* Schltdl. var. *montanum* Kunze: 549 (1836); Schelpe & Anthony: 248 (1986); Burrows: 304 (1990). *Dryopteris pentheri* Krasser var. *montana* (Kunze) Alston: 14 (1956a). Type: Wittebergen, in rupestribus, 2 500 m, *Drège s.n.* [BM!, lecto., designated by Roux (1986)]; Sneeuwbergen, locis rupestribus umbrosis, 200 m, *Drège s.n.* (BM!, isosyn.).

*Dryopteris esterhuyseniae* Schelpe & N.C.Anthony: 148 (1982); Schelpe & Anthony: 248 (1986); Burrows: 306 (1990). Type: Natal, Drakensberg, MnWeni area, steep rocky bank above kloof below Rockies, S-aspect, 2 300–2 700 m, 07/1953, *Esterhuysen 21663* (BOL!, holo.; BM, NBG!, iso.).

**ILLUSTRATION:** Burrows: t. 72, fig. 310, 310a, b (1990).

Terrestrial or epilithic, in moist or seasonally moist rock crevices, and at boulder bases in montane regions, exposed or partially shaded, 1 500–3 000 m.

**DISTRIBUTION:** Lesotho and South Africa.

3. *Dryopteris inaequalis* (Schltdl.) Kuntze, Revisio generum plantarum 2: 813 (1891); Sim: 106 (1915), p.p.; Jacobsen: 435 (1983), p.p.; Schelpe & Anthony: 247 (1986), p.p.; Burrows: 302 (1990), p.p. *Aspidium inaequale* Schltdl.: 23, 24 (1825b). *Lastrea inaequalis* (Schltdl.) C.Presl: 77 (1836). *Nephrodium inaequale* (Schltdl.) Hook.: 125 (1862a), non Schrad. (1824); Sim: 182 (1892). *Polystichum inaequale* (Schltdl.) Keyserl.: 44 (1873). Type: In Promontorio bonae spei, *Mundt & Maire s.n.* [B!, lecto., designated by Pichi Sermolli (1984)].

*Nephrodium filix-mas* var. *elongatum* sensu Sim: 180 (1892).

*Dryopteris elongata* sensu Sim: 104 (1915), p.p.

**ILLUSTRATION:** Fig. 14F & G.

Terrestrial, on moist or seasonally moist forest floors, often along streams, mostly deeply shaded, 20–2 100 m.

**DISTRIBUTION:** South Africa.

4. *Dryopteris manniana* (Hook.) C.Chr., Index filicum: 276 (1905); Schelpe: 223 (1970); Schelpe & Diniz: 240 (1979); Jacobsen: 440 (1983); Burrows: 303 (1990). *Polypodium mannianum* Hook.: 253 (1863). *Phegopteris manniana* (Hook.) Kuhn: 123 (1868). Type: Fernando Po, on the peak, 2 000 ft, 1860, *G. Mann s.n.* (K, holo.).

**ILLUSTRATION:** Schelpe: t. 63, fig. 1, 2 (1970).

Terrestrial, in undergrowth and along streams in moist, evergreen forests, deeply shaded, 600–1 700 m.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Côté d'Ivoire, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone, Tanzania, Uganda and Zimbabwe.

5. *Dryopteris pentheri* (Krasser) C.Chr., Index filicum: 284 (1905). *Nephrodium pentheri* Krasser: 5 (1900). Type: Orange Free State, Van Reenens Pass, 4/03/1895, *Krook s.n.*, sub *Penther Plantae Austro-Africanæ 36* [W 8042!, lecto., designated by Pichi Sermolli (1985b); BM!, isolec.].

*Dryopteris inaequalis* sensu Schelpe: 222 (1970), p.p.; Schelpe & Diniz: 238 (1979).

**ILLUSTRATION:** Fig. 14I.

Terrestrial, in seasonally moist conditions among rocks, streambanks, forests and forest margins, exposed or deeply shaded, 500–2 200 m.

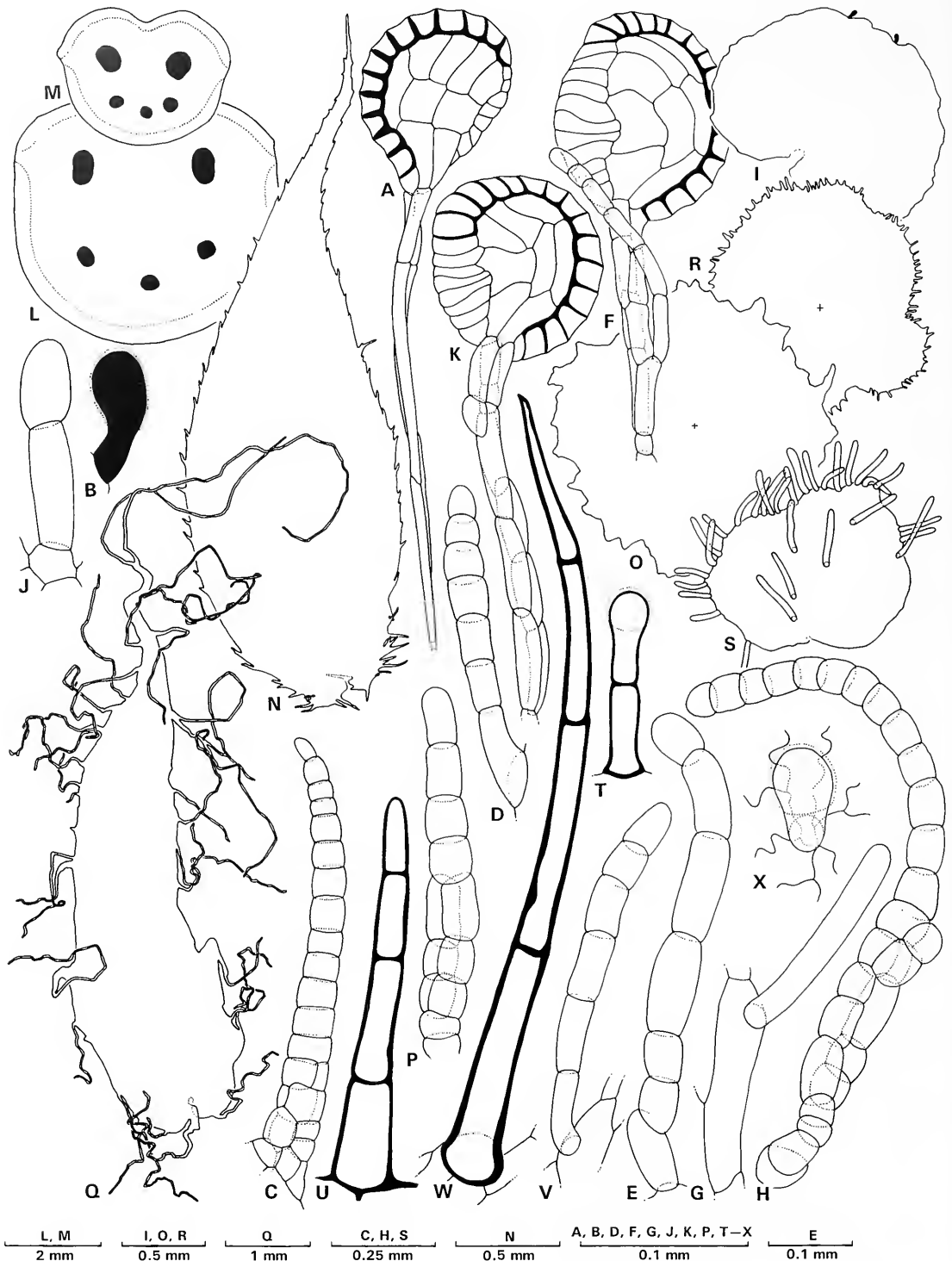


FIGURE 14A–X, Dryopteridaceae and Tectariaceae. A & B, *Rumohra adiantiformis*, A, sporangium; B, paraphyse, Maguire 506 (NBG); C & D, *Nothoperanema squamiseta*, C, hair from the adaxial surface of the lamina; D, hair from the abaxial surface of the lamina, Kluge 2457 (NBG); E, *Dryopteris athamantica*, hair from the abaxial surface of the lamina, Roux 348 (NBG); F & G, *D. inaequalis*, F, sporangium; G, hair from the abaxial surface of the lamina, MacOwan s.n. (NBG); H, *D. kilemensis*, hair from the abaxial surface of the lamina, Burrows 1675 (NBG); I, *D. petheri*, indusium, Roux 570 (NBG); J & K, *Arachniodes webbiana* subsp. *foliosa*, J, paraphyse; K, sporangium, Schelpe 5798 (NBG); L & M, *Polystichum incongruum*; L, cross section of the stipe; M, cross section of the rachis, Roux 2377 (NBG); N, *P. wilsonii*, stipe palea, Alluaud 275 (P); O & P, *Cyrtomium micropterum*, O, indusium; P, hair from the abaxial surface of the lamina, Roux 1913 (NBG); Q, *Didymochlaena truncatula*, stipe palea, Roux 1931 (NBG); R, *Tectaria gemmifera*, indusium, Van Jaarsveld 6077 (NBG); S–V, *Ctenitis cirrhosa*, S, indusium; T–V, costa hairs, adaxial surface of the lamina; W & X, *Megalastrum lanuginosum*, W, hair from the abaxial surface of the lamina; X, glandular hair from the abaxial surface of the lamina, Roux 1934 (NBG). Scale bars: L, M, 2 mm; I, O, R, 0.5 mm; Q, 1 mm; C, H, S, 0.25 mm; N, 0.5 mm; A, B, D, F, G, J, K, P, T–X, 0.1 mm; E, 0.1 mm.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Ethiopia, Guinea, Kenya, Lesotho, Liberia, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

6. *Dryopteris schimperiana* (Hochst. ex A.Braun) C.Ch., Index filicum: 91, 291 (1905). *Aspidium schimperianum* Hochst. ex A.Braun: 708 (1841). Type: Ethiopia, *Schimper s.n.* (B?, holo.).

Terrestrial, on moist streambanks in miombo woodland, lightly shaded, 700–900 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Ethiopia, Kenya and Zambia.

3. Section **Cinnamomeae** Fraser-Jenk. in Bulletin of the British Museum (Natural History), Botany 14: 193 (1986). Type: *Dryopteris cinnamomea* (Cav.) C.Ch.; *Tectaria cinnamomea* Cav.

*Dryopteris athamantica* (Kunze) Kuntze, Revisio generum plantarum 2: 812 (1891); Sim: 107 (1915); Schelpe: 221 (1970); Schelpe: 174 (1977); Schelpe & Diniz: 237 (1979); Jacobsen: 433 (1983); Schelpe & Anthony: 247 (1986); Burrows: 300 (1990). *Aspidium athamanticum* Kunze: 123 (1844b). *Lastrea athamantica* (Kunze) T.Moore: 311 (1853). *Nephrodium athamanticum* (Kunze) Hook.: 125 (1862a); Sim: 183 (1892). Type: Ad portum Natalensem in collibus graminosis et locis paludosis, 02/1842, *Gueinzus s.n.* (LZ, holo.†; KI, lecto., here designated).

*Lastrea plantii* T.Moore: 227 (1853). Type. Natal, Mooi River, *Plant 313* (BM, holo.).

**ILLUSTRATIONS:** Fig. 14E; Schelpe & Anthony: t. 84, fig. 2, 2a (1986).

Terrestrial, in seasonally moist montane grasslands among rocks, in ditches, forest margins and less frequently in forests, exposed or shaded, 900–2 450 m.

**DISTRIBUTION:** Angola, Burundi, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Guinea, Kenya, Lesotho, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

4. Section **Lophodium** (Newman) C.Ch. ex H.Itô, Nova flora japonica 4: 65 (1939). *Lophodium* Newman: 371, app. XVI (1851). Type: *Lophodium multiflorum* (Roth) Newman (now *Dryopteris dilatata* (Hoffm.) A.Gray), designated by Newman (1851).

*Dryopteris antarctica* (Baker) C.Ch., Index filicum, Supplementum 1: 29 (1913). *Nephrodium antarcticum* Baker: 479 (1875). Type: Island of 'Amsterdam'. (St. Paul), *Staunton s.n.* (BM, holo.).

*Dryopteris callolepis* C.Ch.: 177 (1924); Schelpe: 223 (1970); Jacobsen: 439 (1983); Schelpe & Anthony: 249 (1986); Burrows: 304 (1990). Type: Kenya, Aberdare: regio bambusina superior, ca. 2 800 m, 31/03/1922, *R.E. & T.C.E. Fries 2554* (BM!, holo.).

**ILLUSTRATION:** Schelpe & Anthony: t. 85, fig. 1, 1a (1986).

Terrestrial or epilithic, cool, shaded rocks crevices, at boulder bases, in gullies and rarely in forests, mostly partially shaded, 1 000–2 000 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Kenya, Malawi, Rwanda, South Africa, Tanzania, Uganda and Zimbabwe.

**0190600 ARACHNIODES** Blume, Enumeratio plantarum javae 2: 241 (1828). Type: *Arachniodes aspidioides* Blume.

Plants terrestrial or epilithic. *Rhizome* dictyostelic, short-decumbent. *Fronde*s monomorphic, approximate; stipe and rachis adaxially sulcate, open to the sulci of the lower order axes; lamina pinnately compound, anadromous, basiscopically developed; hypostomatic, stomata of the polycytic type; venation anadromous, free, pinnately branched, ending near the margin. *Indumentum* composed of narrow paleae, entire or with small unicellular thin-walled cells along the margin and ending in a small thin-walled cell, occurring on the rhizome, axes and abaxially on the lamina along the veins. *Sori* circular, at the apex of primary anadromous vein branches or dorsally on the veins; sporangium long-stalked, simple, 3-seriate below the capsule; capsule globose, with 13–16 indurated annulus cells and a well defined stomium; indusium peltate, reniform, entire; receptacle with few 2- and 3-celled paraphyses. *Spores* ellipsoidal, monolete, echinate, 23–42 µm long. *Gametophyte*: mature thallus cordate, symmetrical, generally broader than long, with a distinct midrib and spreading wings, profusely hairy, hairs unicellular, secretory; antheridium 3-celled, the basal cell funnel-shaped, dehiscing by the collapse of the cap cell; archegonium neck with 4–5 tiers of cells, curved towards the posterior, the neck canal cell binucleate, swollen towards the apex. Chromosome number based on  $2n = 82$ .

A genus of approximately 50 species mostly in central East Asia, a few in the Americas with one reaching Africa.

*Arachniodes webbia* (A.Braun) Schelpe in Boletim da Sociedade Broteriana, Sér. 2, 41: 203 (1967). *Aspidium webbiana* A.Braun: 711 (1841). Type: In montosis siccis Maderae, ad Sanctum Annam et Sanctum Vincentem, *sine coll. s.n.* (B 90924, holo.).

subsp. **webbia** is confined to Madeira.

subsp. **foliosa** (C.Ch.) Gibby et al. in Botanica Helvetica 102: 229–245 (1992). *Dryopteris foliosa* C.Ch.: 61 (1937). *Arachniodes foliosa* (C.Ch.) Schelpe: 203 (1967); Schelpe: 228 (1970); Jacobsen: 450 (1983); Schelpe & Anthony: 259 (1986); Burrows: 318 (1990). Type: British East Africa: Mt. Kinangop, 2 350 m, in forest, 17/02/1912, *Ch. Alluaud 255* (BM, holo.).

*Aspidium aristatum* sensu Sim: 169 (1892).

*Polystichum aristatum* sensu Sim: 119 (1915).

Chromosome number:  $n = 82$  (Gibby et al. 1992)

ILLUSTRATIONS: Fig. 14J & K; Schelpe: t. 65, fig. 1, 2 (1970).

Terrestrial or epilithic, on moist cliff faces and streambanks in forests, deeply shaded, 1 000–2 130 m.

DISTRIBUTION: Kenya, Malawi, Rwanda, South Africa, Tanzania, Uganda, Zambia and Zimbabwe.

**0190900 POLYSTICHUM** *Roth*, Tentamen florae germanicae 3: 31, 69 (1799), nom. cons. Lectotype: *Polystichum lonchitis* (L.) Roth; *Polypodium lonchitis* L., designated in Farr *et al.*: (1979).

Plants terrestrial or epilithic, rarely epiphytic. *Rhizome* dictyostelic, erect to suberect and mostly unbranched or decumbent and branched, often stoloniferous. *Fronds* monomorphic, caespitose or closely to widely spaced; stipe proximally convex adaxially, becoming shallowly to deeply sulcate higher up, not open to the sulci of the lower order axes; lamina pinnately compound, proximal acroscopic pinnules generally enlarged; hypostomatic, stomata mostly of the anomo-, polo- and copolocytic types; aerophores in dorso-lateral lines along the axes; venation free, branched, anadromous. *Indumentum* composed of narrow and/or broad, sessile or short-stalked paleae, margins various, often bearing unicellular thin-walled cells, the apex ending in an oblong thin-walled or acicular cell. *Sori* circular, essentially uniseriate, dorsally at or near a vein ending, sporangium stalk simple or with unicellular thin-walled cells, 3-seriate below the capsule, with 8–(13)–30 indurated annulus cells and a well defined stomium; indusiate or exindusiate, indusium peltate, the margin variously sculptured, mostly persistent, with or without thin-walled cells along the margin. *Spores* ellipsoidal, monolete, perispore irregularly folded, mostly somewhat spinulose, often perforated, 32–46 µm long. *Gametophyte*: mature thallus epigeal, cordate, deeply notched, midrib thickened bearing rhizoids and gametangia, wings with unicellular papillate glandular and eglandular hairs on both the surfaces; antheridia borne on the wings close to the midrib, 3-celled, the basal cell funnel-shaped, dehiscing by the collapse of the cap cell; archegonium neck with 4–5 tiers of cells, curved towards the posterior, the neck canal cell binucleate. Chromosome number based on  $2n = 82, 123, 164, 328$ , apogamy known.

A genus of approximately 220 species with a near cosmopolitan distribution.

#### KEY TO THE SPECIES:

- 1a Lamina 1-pinnate (rarely 1-pinnate-pinnatifid) ..... 4. **P. macleae**
- 1b Lamina 2-pinnate to 3-pinnate-pinnatifid:
  - 2a Rhizome erect, rarely branched; fronds caespitose:
    - 3a Larger rhizome and stipe base palea margins distally and superficially with long uniseriate hairs ..... 3. **P. luctuosum**
    - 3b Larger rhizome and stipe base paleae without marginal and superficial indument:
      - 4a Fronds up to 1.5 m long; conspicuously larger paleae mostly confined to the stipe, rugose ..... 10. **P. transvaalense**
      - 4b Fronds up to 1.05 m long; conspicuously larger paleae extending up rachis, never rugose:
        - 5a Distal pinnae generally folded back along the rachis ..... 11. **P. wilsonii**
        - 5b Distal pinnae not folded back along the rachis ..... 8. **P. x saltum**
  - 2b Rhizome widely creeping or decumbent, mostly branched; fronds approximate to widely spaced:
    - 6a Sori exindusiate:
      - 7a Rhizome up to 5 mm in diameter; stipe and rachis paleae with long filiform outgrowths along the margin ..... 5. **P. marionense**
      - 7b Rhizome up to 10 mm in diameter; stipe and rachis paleae with few short multicellular outgrowths along the margin ..... 9. **P. transkeiense**
    - 6b Sori indusiate:
      - 8a Rhizome paleae narrowly linear, conspicuously rugose, often with a few filiform outgrowths along the margin; indusium up to 1 mm in diameter ..... 12. **P. zambesiaceum**
      - 8b Rhizome paleae narrowly lanceolate, not conspicuously rugose, entire or with a few short straight or curved outgrowths along the margin:
        - 9a Proximal acroscopic pinnule less than 22 mm long; larger stipe base paleae mostly discolorous:
          - 10a Rhizome short-decumbent; lamina herbaceous to firmly herbaceous; apogamous (32 spores per sporangium) ..... 6. **P. monticola**
          - 10b Rhizome decumbent, stoloniferous; lamina firmly herbaceous to coriaceous; sexual (64 spores per sporangium) ..... 1. **P. dracomontanum**
        - 9b Proximal acroscopic pinnule usually more than 22 mm long; larger stipe base paleae concolorous:
          - 11a Pinnules inaequilaterally ovate to narrowly trullate, often somewhat falcate, up to 60 x 13 mm; sporangium stalk with or without unicellular gland-like cells; indusium with or without unicellular thin-walled cells along the margin ..... 2. **P. incongruum**
          - 11b Pinnules inaequilaterally ovate, ovate-oblong, ovate-rhomboid to trullate, up to 50 x 19 mm; sporangium stalk and indusium always eglandular ..... 7. **P. pungens**

1. **Polystichum dracomontanum** *Schelpe & N.C. Anthony* in Contributions from the Bolus Herbarium 10: 145 (1982); *Schelpe & Anthony*: 259 (1986); *Burrows*: 316 (1990); *Roux*: 70 (2000b). Type: Natal, Bergville Division. On banks above stream in side kloof west of main kloof, shortly above the Singati Cave (east of Mont-aux-Sources). In unburnt sparse bush or small trees or in the open, c. 6 000 ft, *Esterhuysen 35646* (BOL!, holo.; B, BOL!, C, GH, K, M, MO, NU, P, PRE!, S, iso.).

ILLUSTRATION: *Roux*: fig. 15 (2000b).

Terrestrial, in moist forest margins, along streambanks and rarely also in forests and in montane grassland, exposed or lightly shaded, 1 675–2 745 m.

DISTRIBUTION: Lesotho and South Africa.

2. **Polystichum incongruum** *J.P. Roux* in Botanical Journal of the Linnean Society 125, 1: 35–43 (1997b); *Roux*: 72 (2000b). Type: Swellendam, Marloth Nature Reserve, Koloniesbos, in scree on dry east-facing slope, *Roux 2377* (NBG!, holo.).

Chromosome number:  $2n = 164$  (Roux 1997c).

**ILLUSTRATION:** Fig. 14L & M; Roux: fig. 16 (2000b).

Terrestrial, on moist forest floors, roadcuttings and streambanks, shaded or exposed conditions, 100–1 250 m.

**DISTRIBUTION:** South Africa.

3. ***Polystichum luctuosum*** (Kunze) T.Moore, Index filicum: 95 (1858); Sim: 117 (1915); Schelpe: 228 (1970); Jacobsen: 444 (1983); Schelpe & Anthony: 255 (1986); Burrows: 317 (1990); Roux: 37 (2000b). *Aspidium luctuosum* Kunze: 548 (1836); Sim: 167 (1892). *Polystichum lobatum* (Huds.) C.Presl var. *luctuosum* (Kunze) Christ: 34 (1893). Type: In monte Katriviersberg in sylvis, *Ecklon s.n.* (LZt, syn.); Ad fontes fl. Katrivier prope Philipstown, in sylvis montium, *Ecklon s.n.* (LZt, syn.).

Chromosome number:  $2n = 123$ , apogamous (Roux 1997c).

**ILLUSTRATION:** Roux: fig. 3 (2000b).

Terrestrial or epilithic, in moist or seasonally moist forests, on rocks and along streambanks, deeply shaded, 670–1 825 m.

**DISTRIBUTION:** Lesotho, South Africa, Swaziland and Zimbabwe. Also in the Madagascan region, Asia and Japan.

4. ***Polystichum macleae*** (Baker) Diels, Die natürlichen Pflanzenfamilien 1, 4: 190 (1899), as '*macleanii*'; Sim: 120 (1915); Jacobsen: 443 (1983); Schelpe & Anthony: 253 (1986); Burrows: 309 (1990); Roux: 36 (2000b). *Aspidium macleae* Baker: t. 1654 (1886b), as '*macleai*'; Sim: 170 (1892). Type: In convallibus humidis – Drakensbergen prope 'Pilgrim's Rest Gold Fields', 1894, *McLea 34 sub Bolus 3030* [K!, lecto., designated by Schelpe & Anthony (1986); BOLI, SAM!, isolecto.].

Chromosome number:  $n = 82$ ,  $2n = 164$  (Roux 1997c).

**ILLUSTRATION:** Roux: fig. 2 (2000b).

Terrestrial, rarely epiphytic, on moist forest floors, along streambanks, and rarely among rocks in montane grasslands, light or deeply shaded, 1 350–1 960 m.

**DISTRIBUTION:** South Africa and Swaziland.

5. ***Polystichum marionense*** Alston & Schelpe in Journal of South African Botany 23: 106, t. 34, fig. 1a (1957); Roux: 58 (2000b). Type: Marion Island, 12/1873, Moseley *s.n.* (BM, holo.); Rand 3192 & 3690 (BM, BOLI!); 3653, 3720, 3766 (BOLI!, para.).

**ILLUSTRATION:** Roux: fig. 10 (2000b).

Terrestrial, in moist rock crevices, exposed or lightly shaded, 10–100 m.

**DISTRIBUTION:** Marion and Prince Eduard Islands, also on Crozet Islands.

6. ***Polystichum monticola*** N.C.Anthony & Schelpe in Bothalia 15: 554 (1985); Schelpe & Anthony: 257 (1986); Burrows: 314 (1990); Roux: 67 (2000b). Type: Cape Peninsula, Table Mountain, Dark Gorge, below saddle on SE side. Sheltered gully, dry in summer, on steep rocky slope, *Esterhuysen 26685* (BOLI!, holo.); B, C, CHR, G, GH, K, M, MO, NBG!, NU, P, PRE!, iso).

*Polystichum pungens* sensu Sim: 116 (1915), p.p.

Chromosome number:  $2n = 246$ , apogamous (Roux 1997c).

**ILLUSTRATION:** Roux: fig. 14 (2000b).

Terrestrial, in rock crevices in scree, cliff bases, streambanks, forest margins and forest floors, shaded or exposed situations, 800–2 250 m.

**DISTRIBUTION:** Lesotho and South Africa.

7. ***Polystichum pungens*** (Kaulf.) C.Presl, Tentamen pteridographiae: 83 (1836); Schelpe & Anthony: 254 (1986), p.p.; Burrows: 312 (1990), p.p.; Roux: 75 (2000b). *Aspidium pungens* Kaulf.: 242 (1824). *Dryopteris pungens* (Kaulf.) Kuntze: 813 (1891). *Aspidium aculeatum* (L.) Sw. var. *pungens* (Kaulf.) Sim: 166 (1892), p.p. Type: Habitat in Promontorio b. spei, *Chamisso s.n.* (LE, holo.).

*Polystichum aculeatum* (L.) Roth sensu Sim: 115 (1915), p.p.

*Polystichum lucidum* (Burm.f.) Becherer, auct.

Chromosome number:  $n = 164$ ,  $2n = 328$  (Roux 1997c).

**ILLUSTRATION:** Roux: fig. 17 (2000b).

Terrestrial, in moist or seasonally moist forest floors, rarely at moist cliff bases, exposed or deeply shaded, 300–2 150 m.

**DISTRIBUTION:** South Africa.

8. ***Polystichum x saltum*** J.P.Roux in Botanical Journal of the Linnean Society 124: 376 (1997a). Type: South Africa: KwaZulu-Natal, 2828 (Bethlehem): Royal Natal National Park, Gudu forest, near Gudu waterfall, c. 1 800 m, *Roux 2510b* (NBG, holo.).

Chromosome number:  $2n = 164$ ; meiosis irregular (Roux 1997c).

Terrestrial or epilithic, in moist evergreen forests, deeply shaded, 1 600–1 800 m.

**DISTRIBUTION:** South Africa.

9. **Polystichum transkeiense** W.Jacobsen in Journal of South African Botany 44: 169 (1978); Jacobsen: 445 (1983), p.p.; Schelpe & Anthony: 253 (1986); Burrows: 310 (1990), p.p.; Roux: 60 (2000b). Type: Transkei, Port St Johns, near road to second beach, in forest, in deep shade, 67 m, W.B.G. Jacobsen 4301 (PRE!, holo.).

Chromosome number:  $2n = 164$  (Roux 1997c).

**ILLUSTRATION:** Roux: fig. 11 (2000b).

Terrestrial, in moist evergreen forests, deeply shaded, 20–900 m.

**DISTRIBUTION:** South Africa.

10. **Polystichum transvaalense** N.C.Anthony in Contributions from the Bolus Herbarium 10: 146 (1982); Schelpe & Anthony: 255 (1986); Burrows: 314 (1990); Roux: 49 (2000b). Type: South Africa, Transvaal, Pietersburg District, Woodbush Forest Reserve, Bredenkamp & Van Vuuren 450 (BOL!, holo.; PRE!, iso.).

*Polystichum setiferum* var. *fuscopaleaceum* sensu Schelpe: 226 (1970); Schelpe & Diniz: 242 (1979); Jacobsen: 447 (1983).

Chromosome number:  $2n = 164$  (1997c).

**ILLUSTRATION:** Roux: fig. 7 (2000b).

Terrestrial or epilithic, rarely as low-level epiphytes, deeply shaded moist forests, on streambanks and on rocks along streams, 360–2 800 m.

**DISTRIBUTION:** Bioko, Cameroon, Democratic Republic of the Congo, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Rwanda, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

11. **Polystichum wilsonii** Christ in Botanical Gazette 51: 353 (1911). Type: China, Szechuan Province, Mupin, woodlands, 4 000–6 000 ft, Wilson 2614 (BM!, holo.); Roux: 53 (2000b).

*Polystichum lobatum* (Huds.) C.Presl var. *ruwenzoriense* Pirota: 478 (1909). *Polystichum fuscopaleaceum* Alston var. *ruwenzoriense* (Pirota) Pic.Serm.: 90 (1977d). Type: Ruwensori: Nella foresta scendendo da Kichuchu a Nakitava, Roccati et Cavalli-Molinelli s.n. (TO, holo.).

*Polystichum aculeatum* (L.) Roth var. *mildbraedii* Brause: 379 (1915). Type: Fernando Poo (Bioko), Nordseite des Pics Sta. Isabel oberhalb Basilé, Grasflur-Region des Gipfels mit viel *Ericinella*, zwischen Gras, ca. 2 700 m ü. M., Mildbraed 7180 (B!, holo.).

*Polystichum aculeatum* (L.) Roth var. *rubescens* Bonap.: 214 (1923a). Type: Tanzania. Kilimanjaro. Zone supér des forêts, 2 760 m, Alluud 48 (P!, holo.).

*Polystichum aculeatum* (L.) Roth var. *stenophyllum* Bonap.: 215 (1923a). Type: Kenya. Mont Kênya, versant ouest. Forêt inférieure, 2 400 m, Alluud 241 (P!, holo.).

*Polystichum fuscopaleaceum* Alston: 22 (1956a). *Polystichum setiferum* (Forssk.) T.Moore ex Woyn. var. *fuscopaleaceum* (Alston) Schelpe: 216 (1967). Type: Cameroon. Victoria District. Cameroon Mountain, SW of hut no. 2, 9 100 ft, in gully woodland, Keay FHI 28602 (BM!, holo.).

*Polystichum alticola* Schelpe & N.C.Anthony: 144 (1982); Schelpe & Anthony: 257 (1986); Burrows: 317 (1990). Type: South Africa, Ladismith, Swartberg, Toverkop, 2 160 m, Esterhuysen 26699 (BOL!, holo.; NBG!, PRE!, iso.).

Chromosome number:  $n = 82$ ,  $2n = 164$  (Roux 1997c).

**ILLUSTRATIONS:** Fig. 13N; Roux: fig. 9 (2000b).

Terrestrial or epilithic, in moist evergreen montane forests, in rock overhangs and at the base of cliffs in montane regions, 1 500–2 000 m.

**DISTRIBUTION:** Bioko, Cameroon, Democratic Republic of the Congo, Ethiopia, Kenya, Lesotho, South Africa, Tanzania, Uganda and Zimbabwe. Also in Asia, Japan and Taiwan.

12. **Polystichum zambsiacum** Schelpe in Boletim da Sociedade Broteriana, Sér. 2, 41: 215 (1967); Schelpe: 226 (1970); Schelpe & Diniz: 241 (1979); Jacobsen: 445 (1983); Burrows: 310 (1990); Roux: 63 (2000b). Type: Rhodesia, Umtali District, Henkels Nek, Stapleford, 5 800 ft, 16/07/1955, Schelpe 5751 (BOL!, holo.; BM!, BOL!, iso.).

**ILLUSTRATION:** Roux: fig. 13 (2000b).

Terrestrial or epilithic, in evergreen montane mist forests, along forest margins, on moist forest floors and streambanks in forests, rarely in montane grassland, 1 370–2 200 m.

**DISTRIBUTION:** Malawi, Mozambique, Tanzania and Zimbabwe.



**0191600 CYRTOMIUM** C.Presl, Tentamen pteridographiae: 86, t. 2, fig. 26 (1836). Lectotype: *Cyrtomium falcatum* (L.f.) C.Presl; *Polypodium falcatum* L.f., designated by J. Smith (1875).

Plants terrestrial or epilithic. *Rhizome* dictyostelic, suberect to erect. *Fronde*s monomorphic, caespitose; stipe and rachis adaxially shallowly sulcate, not open to the sulci of the lower order axes; lamina pinnately compound; hypostomatic, stomata of the polocytic type; venation reticulate, with simple excurrent included veinlets. *Indumentum* composed of narrow paleae occurring on the rhizome and axes, also with simple, centrally pluriserial hairs occurring abaxially on the lamina. *Sori* large, circular, scattered, dorsally or terminally on included veinlets; sporangium long-stalked, simple, 3-seriate below the capsule, capsule globose, with 13–16 indurated annulus cells and a well defined stomium; indusium large, peltate, erose. *Spores* ellipsoidal, monolete, irregularly tuberculate, 30–47 µm long. *Gametophyte*: mature thallus cordate, symmetrical, with a distinct midrib and spreading wings, profusely hairy, hairs unicellular, secretory; antheridium 3-celled, the basal cell funnel-shaped, dehiscing by the collapse of the cap cell; archegonium neck with 4–5 tiers of cells, curved towards the posterior, the neck canal cell binucleate, swollen towards the apex; apogamy known. Chromosome number based on  $2n = 82$ .

A genus of approximately nine species which is centred in eastern Asia.

***Cyrtomium micropterum*** (Kunze) Ching, Icones filicum sinicarum 3: t. 127 (1935), as '*micropteris*'. *Cyrtomium caryotideum* (Wall. ex Hook. & Grev.) C.Presl var. *micropterum* (Kunze) C.Chr.: 66 (1934), as '*micropteron*'; Schelpe & Anthony: 251 (1986); Burrows: 325 (1990). *Cyrtomium falcatum* (L.f.) C.Presl var. *micropteris* (Kunze) C.Chr.: 52 (1930). *Aspidium anomophyllum* Zenker forma *micropteris* Kunze: 278 (1851a), as '*microptera*'. *Phanerophlebia caryotideae* (Wall. ex Hook. & Grev.) Copel. var. *micropteris* (Kunze) Tardieu: 326 (1958a); Jacobsen: 455 (1983). Type: C. Presl, Tentamen pteridographiae t. 2, fig. 26 (1936), icon.

*Cyrtomium falcatum* sensu Sim: 171 (1892); Sim: 121 (1915).

**ILLUSTRATION:** Fig. 140 & P.

Terrestrial, in deeply shaded ravines and streambanks in wet forests, 50–2 000 m.

**DISTRIBUTION:** Kenya, Lesotho, South Africa, Tanzania and Uganda. Also in the Madagascan region.

**0191100 DIDYMOCHLAENA** Desv. in Magazin für de neuesten Entdeckungen in der gesamten Naturkunde, Gesellschaft naturforschender Freunde zu Berlin 5: 303, t. 7, fig. 6, 6a (1811). Type: *Didymochlaena sinuosa* Desv. (now *Didymochlaena truncatula* (Sw.) J.Sm.; *Aspidium truncatulum* Sw.).

Plants terrestrial. *Rhizome* dictyostelic, massive, erect. *Fronde*s monomorphic, caespitose; stipe and rachis adaxially sulcate, not open to the sulci of the lower order axes; lamina monomorphic, anadromous or isodromous, pinnately compound, pinnae articulated to the rachis, pinnules articulated at the base; hypostomatic, stomata of the polocytic type; venation anadromous, free, pinnately branched, ending near the margin. *Indumentum* composed of paleae bearing simple or branched, exceptionally long marginal outgrowths occurring on the rhizome, axes and abaxially on lamina, and short spike-like outgrowths at the pinnule base. *Sori* oval, at the apex of an abbreviated anadromous vein branch; sporangium long-stalked, simple, 3-seriate below the capsule, capsule globose, with 13–14 indurated annulus cells and a well defined stomium; indusium elongate, centrally attached along an elongate receptacle. *Spores* ellipsoidal, monolete, tuberculate, 30–37 µm long. *Gametophyte*: mature thallus cordate, symmetrical, generally broader than long, with a distinct midrib and spreading wings, glabrous; antheridium 3-celled, the basal cell funnel-shaped, dehiscing by the collapse of the cap cell; archegonium neck with 4–5 tiers of cells, curved towards the posterior, the neck canal cell binucleate, swollen towards the apex. Chromosome number based on  $2n = 82$ .

A monospecific genus with a pantropical distribution. Pérez-García & Riba (1999) described the prothallial development as that of the *Adiantum*-type.

***Didymochlaena truncatula*** (Sw.) J.Sm. in Journal of Botany (Hooker) 4: 196 (1841b); Sim: 112 (1915); Schelpe: 220 (1970); Schelpe: 173 (1977); Schelpe & Diniz: 235 (1979); Jacobsen: 432 (1983); Schelpe & Anthony: 243 (1986); Burrows: 299 (1990). *Aspidium truncatulum* Sw.: 36 (1801). Type: M. Houttuyn, Natuurlijke historie 2: 14, t. 100, fig. 1 (1783), icon.

*Didymochlaena dimidiata* Kunze: 122 (1844b). Type: In montium faucibus sylvaticis umbrosissimis infra catarractam magnam inter Omfondi et Tagela fluvios Portus Natalensis, 02–04/1842, Gueinzius s.n. (LZ, holo. t; K, L, iso.).

*Didymochlaena lunulata* Desv. sensu Sim: 164 (1892).

**ILLUSTRATIONS:** Fig. 14Q; Burrows: t. 304 (1990).

Terrestrial, in wet conditions along streams in deeply shaded moist forests, 200–1 800 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Congo, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Kenya, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in Madagascan region. Pantropical.

27. **TECTARIACEAE** Panigrahi, Journal of the Orissa Botanical Society 8: 41 (1987). *Dennstaedtiaceae* Pic.Serm. subfam. *Tectarioideae* Holttum: 152 (1947). *Dryopteridaceae* Ching subfam. *Tectarioideae* Holttum ex Nayar: 235 (1970). Type: *Tectaria* Cav.

Plants terrestrial or epilithic. *Rhizome* dictyostelic, short and erect or widely creeping; roots with an outer parenchymatous cortex and a sclerenchymatous inner cortex. *Fronde*s monomorphic, caespitose or widely spaced; stipe and rachis adaxially sulcate, sulcus not open to the sulci of the lower order axes; lamina pinnately compound, proximal pinnae often basiscopically developed, often with

proliferating buds along the lamina axes; hypostomatic, stomata mostly of the polycytic type; venation anadromous, forked or pinnately branched, free or anastomosing, with or without included veinlets. *Indumentum* composed of sessile paleae with or without marginal and superficial indument occurring on the rhizome and axes, clavate unicellular glands, and 2- or 3-celled hairs and subulate or acicular hairs occurring along the axes and lamina surfaces. *Sori* circular, dorsal or terminal on branched or unbranched veins; receptacle not paraphysate; sporangium long-stalked, simple or with trichomes, 3-seriate below the capsule; capsule globose, with 11–(13)–15 indurated annulus cells; indusium reniform or peltate, often with marginal and superficial indument composed of unicellular glands, unicellular oblong hairs, multicellular hairs terminating in a thin-walled cell and acicular hairs. *Spores* ellipsoidal, monolete, tuberculate or winged, wings cristate, echinate or echinulate. Chromosome number based on  $2n = 80$  or  $82$ .

A near cosmopolitan family characterized by a radial or near radial rhizome stele and the presence of acicular, also termed ctenoid hairs, occurring on the fronds, and a chromosome number based on  $2n = 40$  or  $41$ .

#### KEY TO THE GENERA:

- 1a Frond axes often with copious paleae; smaller paleae partly clathrate with isodiametric cells ..... 0192300 **Ctenitis**
- 1b Smaller frond axes with few non-clathrate paleae; unicellular glands lacking except in *Lastreopsis*:
  - 2a Adaxially with some thick multicellular hairs present between the veins, at least near the sinuses between the lobes; where the veins anastomose the costal areoles are narrow and of even width ..... 0191700 **Tectaria**
  - 2b Adaxially with thick hairs between the veins; where the veins anastomose the costal areoles are not elongated nor of even width:
    - 3a Fronds large, 2-pinnate, arising from a large erect caudex; axes adaxially with multiseptate thin-walled acicular hairs ..... 0192400 **Megalastrum**
    - 3b Fronds never very large; caudex not large and erect; axes adaxially with firm, terete or ctenoid hairs:
      - 4a Pinnule bases decurrent as a narrow wing with thickened margin; fronds of young plants not tripartite; axes adaxially with various hairs; glands present on abaxial surface of lamina and on sporangia ..... 0192700 **Lastreopsis**
      - 4b Pinnule bases not decurrent; fronds of young plants tripartite except in *T. varians*; axes adaxially with ctenoid hairs; cylindrical glands present ..... 0192200 **Triplophyllum**

**0191700 TECTARIA** Cav., *Anales de historia natural* 1: 115 (1799). Type: *Tectaria trifoliata* (L.) Cav.; *Polypodium trifoliatum* L.

*Aspidium* Sw.: 4, 29 (1801). Type: *Aspidium trifoliatum* (L.) Sw.; *Polypodium trifoliatum* L. (now *Tectaria trifoliata* (L.) Cav.).

Plants terrestrial or epilithic. *Rhizome* dictyostelic, short, suberect. *Fronds* monomorphic, caespitose; stipe and rachis adaxially shallowly sulcate, not open to the sulci of the lower order axes; lamina pinnately compound, the basal pinna pair basiscopically developed; rachis and secondary rachis mostly winged, often with several proliferous buds along the rachis; hypostomatic, stomata mostly of the polycytic type; venation reticulate, without included veinlets, anadromous and catadromous, the basal primary vein in the upper pinnae/pinnules may arise from the rachis, veins terminating near the margin. *Indumentum* composed of sessile paleae bearing unicellular, bicellular and simple and branched hairs along the margin, also with unicellular superficial hairs occurring on the rhizome and stipe base, also with short subulate and 2–3-celled clavate trichomes adaxially and abaxially on the axes and lamina surfaces. *Sori* circular, dorsally on connectives or at or near the apex of a free vein branch; sporangium long-stalked, 3-seriate below the capsule, with 2- or 3-uniseriate trichomes below the capsule, capsule globose, with 12–13 indurated annulus cells and a well defined stomium; indusium circular, peltate, the margin variously set with long thin-walled cells. *Spores* subellipsoidal, monolete, cristate or echinate, to  $60\text{ }\mu\text{m}$  long. *Gametophyte*: mature thallus cordate, symmetrical, with a distinct midrib and spreading wings, profusely hairy, with unicellular papillate secretory hairs and multicellular clavate hairs with a swollen non-secretory apical cell; antheridium 3-celled, the basal cell funnel-shaped, dehiscing by the collapse of the cap cell; archegonium neck with 4–5 tiers of cells, curved towards the posterior, neck canal cell binucleate, swollen towards the apex. Chromosome number based on  $2n = 80$ .

A genus of approximately 210 species mostly occurring in the palaeotropics, but with about 40 species distributed in the neotropics. The genus is divided into two sections (Holtum 1987). All the species in southern Africa belong to section *Sagenia* (C.Presl) Holtum, a section characterized by anastomosing veins without included veinlets.

#### KEY TO THE SPECIES:

- Rhizome long creeping; fronds without proliferating buds; sori exindusiate ..... 1. **T. angelicifolia**
- Rhizome erect; fronds caespitose, with proliferating buds; sori indusiate ..... 2. **T. gemmifera**

1. **Tectaria angelicifolia** (Schumach.) Copel. in *Philippine Journal of Science* 2: 410 (1907); Schelpe: 182 (1977). *Polypodium angelicifolium* Schumach.: 228 (1829), as '*angelicaefolium*'. *Aspidium angelicifolium* (Schumach.) C.Chr.: 64 (1905). Type: Guinea, *sine coll.* 304 (C, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 27, fig. 1, 2 (1953b).

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Liberia, Nigeria, Príncipe, São Tomé, Sierra Leone, Sudan, Togo and Uganda.

2. **Tectaria gemmifera** (Fée) Alston in *Journal of Botany* 77: 288 (1939b); Schelpe: 234 (1970); Schelpe: 183 (1977); Schelpe & Diniz: 246 (1979); Jacobsen: 456 (1983); Schelpe & Anthony: 265 (1986); Burrows: 324 (1990). *Sagenia gemmifera* Fée: 313 (1852b). *Aspidium coadunatum* Kaulf. var. *gemmiferum* (Fée) Mett. ex Kuhn: 128 (1868). *Aspidium gemmiferum* (Fée) Ching: 237 (1941c). Type: Habitat in insulâ Madagascariens, *Pervillé s.n.* (missing).

*Nephrodium cicutarium* sensu Sim: 187 (1892).

*Aspidium cicutarium* sensu Sim: 113 (1915).

**ILLUSTRATIONS:** Fig. 14R; Burrows: t. 78, fig. 328, 328a, b (1990).

Terrestrial, on deeply shaded moist forest floors and along streams in evergreen forests, 700–1 600 m.

**DISTRIBUTION:** Angola, Burundi, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, Rwanda, South Africa, Tanzania, Uganda, Zambia, Zimbabwe. Also in the Madagascan region.

**0192200 TRIPLOPHYLLUM** *Holtum* in Kew Bulletin 41: 239 (1986). *Dryopteris* Adans. subgen. *Ctenitis* C.Ch., *D. protensa* (Sw.) C.Ch. group: 91 (1920). Type: *Triplophyllum protensum* (Sw.) *Holtum*; *Aspidium protensum* Sw.

Plants terrestrial. *Rhizome* dictyostelic, long-creeping. *Fronds* monomorphic, approximate to widely spaced, stipe and rachis adaxially shallowly sulcate, not open to the sulci of the lower order axes; lamina pinnately compound, 3-branched in young plants, deltoid-pentagonal to elongate in mature plants, the basal pinnae basiscopically developed, often with bulbils at the pinna base; hypostomatic, stomata of the polocytic type; venation free, simple, forked or pinnately branched or anastomosing forming regular narrow costal areoles lacking included veinlets, anadromous and/or catadromous. *Indumentum* composed of sessile paleae bearing unicellular, bicellular and simple and branched hairs along the margin, also with unicellular superficial hairs occurring on the rhizome and stipe base, and with short subulate and 2–3-celled clavate trichomes adaxially and abaxially on the axes and lamina surfaces. *Sori* small, circular, on abbreviated or non-abbreviated veins; sporangium long-stalked, with 12–13 indurated annulus cells and a well defined stomium; indusium circular, peltate, margin variously set with long thin-walled cells. *Spores* ellipsoidal, monolet, winged, fimbriate, to 58 µm long. Chromosome number based on  $2n = 82$ .

A genus of approximately 20 species mostly centred in Africa, but also occurs in Madagascar and tropical America.

#### KEY TO THE SPECIES:

- 1a Mature fronds elongate, the basal pinnae not significantly longer than next pair above:
  - 2a Some veins always anastomosing; secondary rachis glabrous adaxially ..... 6. **T. varians**
  - 2b At most few anastomoses of distal parts of veins; secondary rachis and smaller axes adaxially with hairs ..... 1. **T. fraternum**
- 1b Mature fronds 3-pinnate or broadly deltoid-pentagonal, the basal pinnae much longer than next pair above:
  - 3a Mature fronds 3-pinnate, all three branches bearing many pairs of subequal oblong pinnules ..... 5. **T. securidiforme**
  - 3b Mature fronds deltoid-pentagonal, suprabasal pinnae deeply lobed or proximally 1-pinnate:
    - 4a Hairs on the abaxial surface of the secondary rachis 0.1–0.2 mm long; basal pinnae of mature plants 400 mm or more long ..... 2. **T. gabonense**
    - 4b Hairs on the abaxial surface of the secondary rachis longer, at least near the base; basal pinnae of mature plants to 250 mm long:
      - 5a Hairs absent from the abaxial surface of the veins and the lamina between them ..... 4. **T. pilosissimum**
      - 5b Hairs present on the abaxial surface of the veins and often on the lamina between them ..... 3. **T. heudelotii**

1. **Triplophyllum fraternum** (Mett.) *Holtum* in Kew Bulletin 41: 253 (1986). *Aspidium fraternum* Mett.: 132 (1868). *Ctenitis fraterna* (Mett.) Tardieu: 342 (1953a). Type: Madagascar, *Boivin s.n.* [W, lecto., designated by Pichi Sermolli (1985a)].

var. **fraternum**

**ILLUSTRATION:** Tardieu-Blot: t. 26, fig. 1, 2 (1953b).

**DISTRIBUTION:** Angola, Bioko, Cameroon, Coté d'Ivoire, Democratic Republic of the Congo, Guinea, Liberia, Sierra Leone and Tanzania. Also in the Madagascan region.

var. **elongatum** (Hook.) *Holtum* appears to be confined to Principe.

2. **Triplophyllum gabonense** *Holtum* in Kew Bulletin 41: 245, fig. 3A (1986). Type: Gabon, Metzie, in secondary forest at 600 m, C. Jeffrey 71 (K, holo.).

Terrestrial, in moist secondary forests, deeply shaded.

**DISTRIBUTION:** Angola.

3. **Triplophyllum heudelotii** Pic.Serm. in Webbia 45: 126 (1991). Type: Sénégal. Habite les lieux rocaillieux, sous les forêts du Fonta Dhiallon, 1839, *Heudelot 703* (G, holo.; FI, G, K, OXF, P, iso.).

*Ctenitis protensa* auct.

**ILLUSTRATION:** Tardieu-Blot: t. 24, fig. 5, 6 (1953b).

Terrestrial, on streambanks in forests, deeply shaded.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Liberia, Nigeria, Principe, São Tomé, Senegal, Sierra Leone, Tanzania, Togo and Uganda.

4. **Triplophyllum pilosissimum** (T.Moore) *Holtum* in Kew Bulletin 41: 246 (1986). *Lastrea pilosissima* T.Moore: 677 (1855). *Ctenitis pilosissima* (T.Moore) Alston: 11 (1956a). Type: cult. Chelsea Physic Garden in 1853, originally from Sierra Leone, *Whitfield s.n.* (K, holo.).

Terrestrial, in moist secondary forests and forest margins, deeply shaded.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Liberia and Sierra Leone.

5. **Triplophyllum securidiforme** (Hook.) Holttum in Kew Bulletin 41: 242 (1986). *Nephrodium subquiquefidum* Hook. var. *securidiformis* Hook.: 130 (1862a). *Aspidium securidiforme* (Hook.) Mett. ex Kuhn: 141 (1868). *Nephrodium securidiforme* (Hook.) Diels: 175 (1899). *Dryopteris securidiformis* (Hook.) C.Chr.: 291 (1905). *Ctenitis securidiformis* (Hook.) Copel.: 125 (1947); Schelpe: 181 (1977). Type: Fernando Po, Barter 2042 [K, lecto., designated by Holttum (1986)].

5.1. var. **securidiforme**

Chromosome number:  $2n = 123$  (Holttum 1986).

**DISTRIBUTION:** Bioko, Cameroon, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Liberia, Nigeria, Príncipe, São Tomé, Senegal and Sierra Leone.

5.2. var. **nanum** (Bonap.) Holttum in Kew Bulletin 41: 243 (1986). *Dryopteris securidiformis* (Hook.) C.Chr. var. *nana* Bonap.: 211 (1923a). *Ctenitis securidiformis* (Hook.) Copel. var. *nana* (Bonap.) Tardieu: 134 (1953b). Type: Gabon. De Dikondou à Moabi, 03/1913, H. Pobéguin 37 (P, holo.).

Epilithic, in forests and along streams, shaded or partially exposed.

**DISTRIBUTION:** Angola, Cameroon, Democratic Republic of the Congo and Nigeria.

6. **Triplophyllum varians** (T.Moore) Holttum in Kew Bulletin 41: 249, 250 (1986). *Dictyopteris varians* T.Moore: 1108 (1863). *Tectaria varians* (T.Moore) C.Chr.: 186 (1934). Type: cult. Hort. Edinb. 1863, originally from Calabar, *sine coll. s.n.* (K, holo.).

*Polypodium sparsiflorum* Hook.: 92, 93 (1864a). *Aspidium sparsiflorum* (Hook.) Diels: 185 (1899). *Tectaria sparsiflora* (Hook.) Alston: 3 (1934). Type: Tropical West Africa: Sierra del Crystal, G. Mann 1634 (K, holo.).

**DISTRIBUTION:** Angola, Cameroon, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea and Nigeria.

**0192300 CTENITIS** (C.Chr.) C.Chr., In Verdoorn, Manual of pteridology: 543 (1938). *Dryopteris Adans.* subgen. *Ctenitis* C.Chr.: 77 (1911). Type: *Dryopteris ctenitis* (Link) Kunze; *Aspidium ctenitis* Link (now *Ctenitis distans* (Brack.) Ching; *Lastrea distans* Brack.).

Plants terrestrial. *Rhizome* dictyostelic, suberect to erect. *Fronds* monomorphic, caespitose; stipe and rachis adaxially sulcate, not open to the sulci of the lower order axes; lamina pinnately compound; hypostomatic, stomata of the polocytic type; venation free, simple or forked, ending near the margin, anadromous and/or catadromous. *Indumentum* composed of narrow paleae that proximally bear short marginal outgrowths and often unicellular glands occurring on the rhizome and axes, also with capitate and cylindrical unicellular glands, pluricellular hairs and acicular hairs occurring on the axes and lamina surfaces. *Sori* small, circular, medially on non-abbreviated veins; sporangium short-stalked, simple, capsule globose, with 13–15 indurated annulus cells and a well defined stomium; indusium small, reniform, marginally attached, with numerous uni- and pluricellular marginal and superficial non-glandular cylindrical thin-walled cells. *Spores* ellipsoidal, monolete, tuberculate or echinate, 25–52 µm long. Chromosome number based on  $2n = 82$ .

A genus of approximately 150 species occurring throughout the tropics and south temperate areas.

**KEY TO THE SPECIES:**

Fronds 1-pinnate; pinna lobe venation pinnately branched; lamina with short appressed hairs ..... 1. **C. cirrhosa**  
Fronds 2-pinnate-pinnatifid to 3-pinnate-pinnatifid; pinna lobe venation simple or forked; lamina glabrous, hairs confined to the rachis and costae ..... 2. **C. speciosa**

1. **Ctenitis cirrhosa** (Schumach.) Ching in Sunyatsenia 5: 250 (1940a); Schelpe: 232 (1970); Schelpe: 178 (1977); Schelpe & Diniz: 244 (1979); Jacobsen: 453 (1983); Burrows: 322 (1990). *Aspidium cirrhosa* Schumach.: 231, 232 (1829). *Nephrodium cirrhosum* (Schumach.) Baker: 472 (1868b). *Dryopteris cirrhosa* (Schumach.) Kuntze: 812 (1891). Type: Guinee, Thonning 302 (C, holo., 3 sheets).

*Nephrodium welwitschii* Baker: 274, 275 (1867d). Type: Angola, Welwitsch 123 (BM, iso.).

**ILLUSTRATIONS:** Fig. 14S–V; Schelpe: t. 67, fig. A, A1 (1970).

Terrestrial, moderately to deeply shaded streambanks in forests and swamp forests, 700–1 370 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Central African Republic, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Ghana, Guinea, Kenya, Malawi, Mozambique, São Tomé, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

2. **Ctenitis speciosa** (Mett. ex Kuhn) Alston in Boletim da Sociedade Broteriana, Sér. 2, 30: 11 (1956a). *Aspidium speciosum* Mett. ex Kuhn: 142 (1868), non D. Don (1825), nom. illeg. Type: Ins. Nossi-beh, Boivin *s.n.*; Madagascaria, Limminghe *s.n.* [W, lecto., designated by Pichi Sermolli (1985a); P, isolecto.].

*Ctenitis protensa* var. *speciosa* sensu Schelpe: 180 (1977).

**DISTRIBUTION:** Angola, Democratic Republic of the Congo, Ghana and Liberia. Also in West Africa and the Madagascan region.

**0192400 MEGALASTRUM** *Holtum* in Gardens' Bulletin Straits Settlements 39: 161 (1987). Type: *Megalastrum villosum* (L.) *Holtum*; *Polypodium villosum* L.

Plants terrestrial. *Rhizome* dictyostelic, suberect to erect, massive. *Fronds* monomorphic, caespitose; stipe and rachis adaxially sulcate, not open to the sulci of the lower order axes; lamina pinnately compound; hypostomatic, stomata of the polycytic type; venation free, simple or forked, ending near the margin, anadromous and catadromous. *Indumentum* composed of small, mostly bullate paleae with a few uniseriate outgrowths at the base occurring on all the axes, and short and long unicellular glandular hairs, uniseriate cylindrical hairs and acicular hairs occurring along the axes and lamina surfaces. *Sori* small, circular, dorsally on abbreviated or non-abbreviated vein branches; sporangium long-stalked, simple, 3-seriate below the capsule, capsule globose, with 13–15 indurated annulus cells and a well defined stomium; indusium small, reniform, bearing unicellular glands, cylindrical and acicular hairs along the margin and superficially. *Spores* ellipsoidal, monolete, echinate, 25–40 µm long. Chromosome number based on  $2n = 82$ .

A genus of approximately 30 species centred in the neotropics with one extending to Africa and the Madagascan region.

**Megalastrum lanuginosum** (Willd. ex Kaulf.) *Holtum* in Gardens' Bulletin Straits Settlements 39: 161 (1987). *Aspidium lanuginosum* Willd. ex Kaulf.: 244 (1824). *Nephrodium lanuginosum* (Willd. ex Kaulf.) Desv.: 262 (1827). *Lastrea lanuginosa* (Willd. ex Kaulf.) T.Moore: 87 (1858). *Polystichum lanuginosum* (Willd. ex Kaulf.) Keyserl.: 45 (1873). *Dryopteris lanuginosa* (Willd. ex Kaulf.) C.Chr.: 273 (1906); Sim: 110 (1915). *Ctenitis lanuginosa* (Willd. ex Kaulf.) Copel.: 124 (1947); Schelpe: 232 (1970); Schelpe & Diniz: 245 (1979); Jacobsen: 454 (1983); Schelpe & Anthony: 264 (1986); Burrows: 324 (1990). Type: Habitat in insula Mauriti, *Aubert du Petit-Thouars* s.n. (B-W 1980a & b).

*Aspidium catopterum* Kunze: 550 (1836). *Lastrea catoptera* (Kunze) Pappe & Raws.: 12 (1858). *Nephrodium catopterum* (Kunze) Hook.: 137 (1862a); Sim: 185 (1892). *Dryopteris catoptera* (Kunze) Kuntze: 812 (1891). Type: Koratra, in sylvia, 500–1 000 p., 1838, Drège s.n. [BM!, lecto., designated by Roux (1986)].

**ILLUSTRATIONS:** Fig. 14W & X; Alston: t. 14, fig. A, B (1959).

Terrestrial, along streams in wet forests, deeply shaded, 200–1 800 m.

**DISTRIBUTION:** Bioko, Kenya, Malawi, Mozambique, São Tomé, South Africa, Tanzania and Zimbabwe. Also in the Madagascan region.

**0192700 LASTREOPSIS** *Ching* in Bulletin of the Fan Memorial Institute for Biology, Ser. 8, 4: 157 (1938a); Tindale (1965). Type: *Lastreopsis recedens* (J.Sm. ex T.Moore) Ching; *Lastrea recedens* J.Sm. ex T.Moore (now *Lastreopsis tenera* (R.Br.) Tindale; *Nephrodium tenerum* R.Br.).

Plants terrestrial. *Rhizome* dictyostelic, erect. *Fronds* caespitose; stipe adaxially sulcate; lamina chartaceous to subcoriaceous, to 3-pinnate; rachis winged near the apex, adaxially medially raised, bordered by two prominent ridges which are continuous with the thickened lamina margin; hypostomatic, stomata mostly of the anomo- and polycytic types; venation free, forked or pinnately branched, ending near the margin. *Indumentum* composed of paleae bearing few marginal processes occurring on the rhizome and stipe, also with short and long uniseriate, acicular hairs and unicellular, oblong glandular hairs occurring on the axes and lamina surfaces. *Sori* indusiate, orbicular, dorsal on abbreviated or unabbreviated veins; indusium fugaceous, reniform, margin and surface with uniseriate oblong glandular hairs; sporangium stalk with an oblong glandular hair, capsule with 12–14 indurated annulus cells and a well defined stomium. *Spores* monolete, globose, ellipsoidal, 30–40 µm long. *Gametophyte*: cordate, with numerous small glandular hairs along the margin and both surfaces; antheridia ventrally on cushion among rhizoids, 3-cellular, the basal cell funnel-shaped; archegonium neck with 4–6 tiers of cells. Chromosome number based on  $2n = 82$ .

A genus of approximately 35 species with a pantropical distribution.

**Lastreopsis currorii** (Mett. ex Kuhn) Tindale in Victoria Naturalist LXXIII: 184 (1957); Tindale: 282 (1965). *Aspidium currorii* Mett.: 130 (1868). *Dryopteris currorii* (Mett.) Kuntze: 812 (1891). *Ctenitis currorii* (Mett.) Tardieu: 342 (1953a); Schelpe: 181 (1977). Type: Africa occidentalis tropica, *Curror* s.n. (K, holo.; B, iso.).

subsp. **currorii**

**ILLUSTRATION:** Tardieu-Blot: t. 23, fig. 3, 4 (1953b).

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Liberia, Nigeria, Tanzania and Uganda. Also in Madagascar.

subsp. **eglandulosa** Tindale is confined to the Congo (Tindale 1965).

28. **WOODSIACEAE** (Diels) *Herter* in Revista Sudamerica de Botánica 9: 14 (1949). *Polypodiaceae* Bercht. & J.Presl tribus *Woodsiaeae* Diels: 159 (1899). Type: *Woodsia* R.Br.

*Polypodiaceae* Bercht. & J.Presl tribus *Physematieae* J.Sm.: 235 (1875). Type: *Physematium* Kaulf. (now *Woodsia* R.Br.).

*Athyriaceae* Alston: 25 (1956b). *Dryopteridaceae* Ching subfam. *Athyrioideae* (Alston) Nayar: 235 (1970). Type: *Athyrium* L.

*Hypodematiaceae* Ching: 96 (1975). Type: *Hypodematium* Kunze

Plants terrestrial or epilithic. *Rhizome* dictyostelic, creeping, short-decumbent or suberect to erect; root cortex parenchymatous throughout, or with an outer sclerenchymatous cortex and an inner parenchymatous cortex or visa versa. *Fronds* monomorphic, approximate or caespitose; stipe and rachis adaxially sulcate, often centrally ridged, if sulcate then the sulcus not open to the sulci of the lower order axes, stipe base with two strap-shaped bundles uniting higher up to form a U- or V-shaped bundle; lamina pinnately compound, basiscopically developed or not; hypostomatic, stomata of the anomo-, polo- and copolocytic types; venation free, forked or pinnately branched ending near the margin, or anastomosing with the excurrent vein ending in the sinus, anadromous and/or catadromous or isodromous. *Indumentum* composed of narrow sessile paleae, the margins various, often with unicellular glandular cells, often with unicellular thin-walled cells superficially, the apex mostly ending in a small or large thin-walled cell occurring on the rhizome and axes; pluricellular hairs of two types, uniseriate or proximally often multistratose, acicular or capitate, the apical cell secretory or not, occurring along the axes and lamina surfaces and unicellular glandular cells occurring on the lamina. *Sori* circular or elongate, linear or J-shaped, dorsal on unabbreviated veins; receptacle nude; sporangium short- or long-stalked, simple or with 1- or 2-celled glandular hairs, 3-seriate below the capsule; capsule globose, with 11–23 indurated annulus cells and a well defined stomium; indusium superior or inferior, marginally or centrally attached, with or without marginal and superficial indument. *Spores* ellipsoidal, monolete, with or without winglike folds, rugate, coarsely tuberculate, echinate or echinulate, 25–65 µm long. *Gametophyte*: spore germination of the *Vittaria*-type; germ filament 4–6 cells long ending in a hair; prothallial development of the *Adiantum*-type; mature thallus epigeal, cordate, with a thick central cushion and uplifted wings, rhizoids confined to the midrib, glabrous or hairy, hairs papillate and secretory and 1- or 2-celled, swollen and non-secretory; antheridium 3-celled, the basal cell funnel-shaped, the cap cell often divided into a circular cell and a sickle-shaped cell, dehiscing by the collapse of the cap cell; archegonium with 4–5 tiers of cells, curved towards the posterior, the neck canal cell binucleate. Chromosome number based on  $2n = 76, 80, 82$  and  $84$ .

A family of near cosmopolitan distribution. The woodsoid ferns are characterized by two strap-shaped vascular bundles in the stipe that merge upwards to form a single U- or V-shaped bundle. The chromosome number in the family is based on  $2n = 80$  or  $82$ . In *Cystopteris* it is based on  $2n = 84$  and in *Woodsia* on  $2n = 76$  and  $82$ . Bower (1928) postulated the family as having derived from a cyathoid ancestor, whereas Holttum (1947) proposed a dennstaedtioid ancestor.

#### KEY TO THE GENERA:

- 1a *Sori* circular; indusium inferior:
  - 2a Indusium elliptic, attached to the posterior side of the receptacle ..... 0195100 **Cystopteris**
  - 2b Indusium cup-shaped, surrounding the receptacle ..... 0195500 **Woodsia**
- 1b *Sori* elongate or, if circular then indusium superior:
  - 3a Lamina bearing paleae, cylindrical hairs and capitate hairs along the axes and veins:
    - 4a *Sori* never back-to-back (asplenoid) ..... 0194100 **Athyrium**
    - 4b *Sori* at least some back-to-back (diplazoid) ..... 0194300 **Diplazium**
  - 3b Lamina bearing acicular and capitate hairs:
    - 5a *Sori* elongate ..... 0194700 **Deparia** sect. **Athyriopsis**
    - 5b *Sori* circular:
      - 6a Indusium small, glabrous ..... 0194700 **Deparia** sect. **Dryoathyrium**
      - 6b Indusium large, with acicular hairs dorsally ..... 0195400 **Hypodematum**

**0194100 ATHYRIUM** Roth, Tentamen florae germanicae 3: 31, 58 (1799). Lectotype: *Athyrium filix-femina* (L.) Roth; *Polypodium filix-femina* L., designated by J. Smith (1875).

Plants terrestrial or epilithic. *Rhizome* short-decumbent or suberect to erect. *Fronds* monomorphic, approximate or caespitose; stipe and rachis adaxially sulcate, not open to the sulci of the lower order axes; lamina pinnately compound; hypostomatic, stomata mostly of the polocytic type; venation free, pinnately branched, ending short of the margin. *Indumentum* composed of narrow and broad, almost entire paleae, mostly confined to the rhizome and frond axes, also with simple, short or long, pluricellular, cylindrical or capitate hairs occurring abaxially along the veins. *Sori* linear, medially along a vein or just past a fork; sporangium short-stalked, simple; capsule globose, with 12–18 indurated annulus cells and a well defined stomium; indusium linear to reniform, attached almost along its entire length, often with long marginal outgrowths. *Spores* ellipsoidal, monolete, rugate, 27–65 µm long. *Gametophyte*: mature thallus cordate, with a thick central cushion and uplifted wings, glabrous or hairy, hairs papillate and secretory, and 1- or 2-celled, swollen and non-secretory hairs; antheridium 3-celled, the basal cell funnel-shaped, dehiscing by the collapse of the cap cell; archegonium with 4–5 tiers of cells, curved towards the posterior, the neck canal cell binucleate. Chromosome number based on  $2n = 80$ .

A near cosmopolitan genus of approximately 180 species mostly concentrated in eastern and south-eastern Asia.

#### KEY TO THE SPECIES:

- 1a Rhizome erect ..... 2. **A. scandicinium**
- 1b Rhizome creeping:
  - 2a Lamina 2-pinnate-pinnatifid, oblong-lanceolate; basal pinnae somewhat reduced, not significantly developed basiscopically ..... 3. **A. schimperi**
  - 2b Lamina 3-pinnate, broadly triangular to pentagonal; basal pinnae not reduced, strongly developed basiscopically ..... 1. **A. annae**

1. **Athyrium annae** Kornaš in Kew Bulletin 33: 99, t. 1, fig. A–G (1978). Type: Zambia, Northern Province, Kalungwishi River Gorge below Lumangwe Falls, 1 030 m, Kornaš & Medwecka-Kornaš Pl. Afr. 3746 (KRA, holo.; Herb. PIC.SERM., iso.).

ILLUSTRATION: Kornaš: t. 1, fig. A–G (1978).

Terrestrial or epilithic, in wet shaded conditions at waterfalls and along streams, 1 000–1 100 m.

**DISTRIBUTION:** Democratic Republic of the Congo and Zambia.

2. **Athyrium scandicinium** (Willd.) C.Presl, Tentamen pteridographiae: 98 (1836); Schelpe: 204 (1970); Schelpe & Diniz: 220 (1979); Jacobsen: 404 (1983); Schelpe & Anthony: 223 (1986); Burrows: 273 (1990). *Aspidium scandicinium* Willd.: 285, 286 (1810). *Allantodia scandicina* (Willd.) Kaulf.: 179 (1824). *Cystopteris scandicina* (Willd.) Desv.: 264 (1827). *Nephrodium scandicinium* (Willd.) Bory: 63 (1833). *Asplenium scandicinium* (Willd.) A.Heller: 775 (1897), non Kaulf. (1824). Type: Habitat in insula Borboniae, Bory de St. Vincent s.n. (B-W 19832!, holo.).

*Asplenium aspidioides* Schltdl.: 24 (1826), nom. illeg.; Sim: 162 (1892). *Allantodia aspidioides* (Schltdl.) Kunze: 191 (1848). *Aspidium aspidioides* (Schltdl.) Christ: 224 (1897). Type: Cape of Good Hope, Bergius s.n. (not located); Réunion, Bory de St. Vincent s.n. (not located).

*Athyrium laxum* Pappe & Raws.: 16 (1858), non Schumacher. (1803). *Asplenium laxum* (Pappe & Raws.) Kuhn: 105 (1868), non R.Br. (1810). Type: Natal, Gueinzus s.n. (not located).

*Athyrium scandicinium* (Willd.) C.Presl var. *rhodesianum* Schelpe: 211 (1967); Schelpe: 204 (1970); Jacobsen: 406 (1983); Burrows: 274 (1990). Type: Rhodesia, Inyanga district, Pungwe Gorge, (N rim), 5 700 ft, 15/07/1955, Schelpe 5722 (BOL!, holo., 3 sheets; BM, iso.).

*Asplenium filix-femina* sensu Sim: 160 (1892); Sim: 131 (1915).

**ILLUSTRATIONS:** Fig. 15A & B; Tardieu-Blot: t. 30, fig. 3, 4 (1953b).

Terrestrial or epilithic, in deep shade on wet forest floors and on rocks in streambanks and at waterfalls, 20–2 100 m.

**DISTRIBUTION:** Burundi, Democratic Republic of the Congo, Kenya, Lesotho, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

3. **Athyrium schimperi** Mougl. ex Fée, Genera filicum: 187 (1852b); Schelpe: 202 (1970); Schelpe: 162 (1977); Jacobsen: 404 (1983); Schelpe & Anthony: 223 (1986); Burrows: 273 (1990). *Asplenium schimperi* (Mougl. ex Fée) A.Braun: 224 (1867). Type: Ad rupes umbrosis prope Debra-Eski Abyssiniae, 9 300 ft, 01/03/1850, Schimper 239 (B, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 35, fig. 3, 4 (1964a).

Terrestrial, generally in rock crevices and at boulder bases in montane grassveld, rarely in forest margins, exposed or partially shaded, 1 200–2 300 m.

**DISTRIBUTION:** Angola, Burundi, Cameroon, Ethiopia, Kenya, Malawi, Rwanda, South Africa, Tanzania, Zambia and Zimbabwe.

**0194300 DIPLAZIUM** Sw. in Journal für die Botanik 1800, 2: 4, 61, 62 (1801). Lectotype: *Diplazium plantagineum* Sw. (now *Diplazium plantaginifolium* (L.) Urb.; *Asplenium plantaginifolium* L.), designated by J. Smith (1875).

*Callipteris* Bory: 282 (1804). Type: *Callipteris prolifera* (Lam.) Bory; *Asplenium proliferum* Lam.

Plants terrestrial. *Rhizome* dictyostelic, suberect to erect; roots forming buds in *D. esculentum*. *Fronds* monomorphic, caespitose; stipe often muricate, stipe and rachis adaxially shallowly sulcate, not open to the sulci of the lower order axes; lamina pinnately compound; often with proliferous buds distally along the costa; hypostomatic, stomata of the anomo-, polo- and copolocytic types; aerophores in two continuous dorsolateral lines along the axes; venation anadromous, free, forked, or pinnately branched, or the lower 3–5 pairs of adjacent groups anastomose, forming an irregular intermediate excurrent vein leading towards the sinus between two adjacent lobes, ending near the margin. *Indumentum* composed of short and/or very long, linear paleae, the margin often with 2–3 rows of dark brown to black cells with similarly coloured bifid teeth, and uniseriate, multicellular hairs ending in a large thin-walled cell occurring on the axes and abaxially along the veins. *Sori* linear, dorsal, medial on vein branches; sporangium short-stalked, simple, 3-seriate below the capsule, capsule globose, with 12–(15)–19 indurated annulus cells and a well defined stomium; indusium linear, attached along its entire length (asplenioid), often back-to-back (diplazioid), entire or with unicellular and pluricellular hairs along the margin; receptacle nude or with simple uniseriate hairs. *Spores* ellipsoidal, monolete, with prominent wing-like folds, 32–55 µm long. *Gametophyte*: mature thallus cordate, with a thick central cushion and uplifted wings, glabrous or hairy, hairs papillate and secretory and 1- or 2-celled, swollen and non-secretory; antheridium 3-celled, basal cell funnel-shaped, dehiscing by the formation of a pore in the cap cell; archegonium with 4–5 tiers of cells, curved towards the posterior, neck canal cell bi- or trinucleate. Chromosome number based on  $2n = 80$  or  $82$ .

A genus of approximately 400 species throughout the warmer parts of the world.

#### KEY TO THE SPECIES:

- 1a Lamina 1-pinnate; veins anastomose below the sinus between the pinna lobes:
  - 2a Pinnae to 255 mm long, to 57 mm wide; veins with regular anastomoses ..... 3. **D. proliferum**
  - 2b Pinnae to 156 mm long, to 22 mm wide; veins with occasional anastomoses near the margin ..... 4. **D. welwitschii**
- 1b Lamina 2- or more pinnate:
  - 3a Veins anastomose below the sinus between the pinna lobes ..... 1. **D. esculentum**
  - 3b Veins free:
    - 4a Sori to 1.5 mm long; receptacle nude ..... 5. **D. zanzibaricum**
    - 4b Sori to 5 mm long; receptacle paraphysate ..... 2. **D. nemorale**

1. **\*Diplazium esculentum** (Retz.) Sw. in Journal für die Botanik 1801, 2: 312 (1803). *Hemionitis esculenta* Retz.: 38 (1791). *Anisogonium esculentum* (Retz.) C.Presl: 116 (1836). *Callipteris esculenta* (Retz.) T.Moore & Houlston: 265 (1851). Type: Habitat in India orientali, J.G. König s.n. (LD!, holo.).

ILLUSTRATION: De Vol & Kuo: t. 157 (1980).

Terrestrial, on wet streambanks, mostly disturbed areas, exposed or partially shaded, 600–800 m.

DISTRIBUTION: Naturalized in South Africa and Zimbabwe, native from India to Polynesia.

2. **Diplazium nemorale** (Baker) Schelpe in Boletim da Sociedade Broteriana, Sér. 2, 41: 212 (1967); Schelpe: 205 (1970); Schelpe & Diniz: 221 (1979); Jacobsen: 408 (1983); Burrows: 278 (1990). *Asplenium nemorale* Baker: 417 (1876). Type: Madagascar, W. Pool s.n. (?K, holo.).

ILLUSTRATION: Schelpe: t. 58, fig. A1, 2 (1970).

Terrestrial, in moist deeply shaded forests, 600–1 800 m.

DISTRIBUTION: Kenya, Malawi, Mozambique, Tanzania and Zimbabwe. Also in the Madagascan region.

3. **Diplazium proliferum** (Lam.) Thouars, Esquisse de la flore de l'Isle de Tristan d'Acugna: 35 (1808); Schelpe: 163 (1977). *Asplenium proliferum* Lam.: 307 (1786). *Callipteris prolifera* (Lam.) Bory: 283 (1804). *Athyrium proliferum* (Lam.) Milde: 353 (1870). Type: Isle de Bourbon, Commerson s.n. (P-LA, holo.).

ILLUSTRATION: Tardieu-Blot: t. 31, fig. 3, 4 (1953b).

Terrestrial, in wet deeply shaded forests.

DISTRIBUTION: Angola, Bioko, Cameroon, Central African Republic, Côté d'Ivoire, Gabon, Ghana, Guinea, Liberia, Nigeria, Príncipe, São Tomé, Sierra Leone, Tanzania, Togo and Uganda.

4. **Diplazium welwitschii** (Hook.) Diels, Die natürlichen Pflanzenfamilien 1, 4: 226 (1899); Schelpe: 163 (1977). *Asplenium welwitschii* Hook.: 235 (1867b). *Athyrium welwitschii* (Hook.) Tardieu: 334 (1952b). Type: Angola, Cuanza Norte, Golungo Alto, Quisucula, Welwitsch 100 (K, holo.; LISU, iso.).

ILLUSTRATION: Tardieu-Blot: t. 32, fig. 5, 6 (1953b).

Terrestrial, in wet deeply shaded forests.

DISTRIBUTION: Angola, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon and Ghana.

5. **Diplazium zanzibaricum** (Baker) C.Chr., Index filicum: 241 (1905); Schelpe: 205 (1970); Schelpe & Diniz: 222 (1979); Jacobsen: 410 (1983); Schelpe & Anthony: 227 (1986); Burrows: 276 (1990). *Asplenium zanzibaricum* Baker: 311 (1891). Type: Zanzibar, J.I. Last s.n. (K!, holo.).

ILLUSTRATIONS: Fig. 15C–E; Schelpe: t. 58, fig. B1, 2 (1970).

Terrestrial, mostly along streambanks in deeply shaded moist evergreen forests, 900–2 200 m.

DISTRIBUTION: Cameroon, Democratic Republic of the Congo, Guinea, Kenya, Malawi, Mozambique, Rwanda, South Africa, Tanzania, Uganda, Zambia and Zimbabwe.

**0194700 DEPARIA** Hook. & Grev., Icones filicum 2: t. 154 (1830a). Type: *Deparia macraei* Hook. & Grev. (now *Deparia prolifera* (Kaulf.) Hook.; *Dicksonia prolifera* Kaulf.).

Plants terrestrial. *Rhizome* dictyostelic, short-creeping or erect. *Fronds* monomorphic, approximate or caespitose; stipe and rachis adaxially shallowly sulcate, not open to the sulci of the lower order axes; lamina pinnately compound; hypostomatic, stomata mostly of the polo- and copolocytic types; venation free, forked, ending near the margin, anadromous or isodromous. *Indumentum* composed of narrow paleae that are entire or often bearing a few unicellular thin-walled cells along the margin and superficially occurring on the rhizome and axes, and short and long uniseriate or often proximally multistratose acicular hairs on the axes and lamina surfaces, predominantly along the veins. *Sori* single or often double on an acroscopic branch of a vein, dorsal, circular or linear; sporangium short-stalked, simple or with a 1- or 2-celled hair near the apex, 3-seriate below the capsule; capsule globose, with 13–16 indurated annulus cells and a well defined stomium; indusium circular or linear, attached at the base or along its entire length, margin subentire or with acicular and cylindrical hairs that may also occur superficially. *Spores* ellipsoidal, monolete, coarsely tuberculate, 25–48 µm long. *Gametophyte*: mature thallus cordate with a distinct midrib and spreading wings, rhizoids confined to the midrib, glabrous or with unicellular hairs along the margin and surfaces; antheridium 3-celled, the basal cell funnel-shaped, dehiscing through a pore in the cap cell; archegonium massive, the neck with 5 tiers of cells, the neck canal cell binucleate. Chromosome number based on  $2n = 80$  or  $82$ .

A genus of approximately 40 species widespread in the temperate and tropical parts of the Old World. One species has become naturalized in southern Africa. As interpreted, the genus consists of four sections of which two occur in southern Africa. Rbcl gene sequences show the group to be monophyletic, supporting Kato's (1977) classification (Sano et al. 2000).

#### KEY TO THE SECTIONS:

- |                                                           |                              |
|-----------------------------------------------------------|------------------------------|
| Sori small, circular; indusium circular to reniform ..... | 1. sect. <b>Dryoathyrium</b> |
| Sori large, linear; indusium linear .....                 | 2. sect. <b>Athyriopsis</b>  |



1. Section **Dryoathyrium** (Ching) M.Kato in Journal of the Faculty of Science, University of Tokyo. Sect. 3, 13: 383 (1984). *Dryoathyrium* Ching: 79 (1941b), excl. *Dryoathyrium pterorachis* (Christ) Ching. *Lunathyrium* Koidz. sect. *Dryoathyrium* (Ching) H.Ohba: 53 (1965). Type: *Deparia boryana* (Willd.) M.Kato; *Aspidium boryanum* Willd.

**Deparia boryana** (Willd.) M.Kato in Botanical Magazine (Tokyo) 90: 36 (1977). *Aspidium boryanum* Willd.: 285 (1810). *Lastrea boryana* (Willd.) T.Moore: 86 (1857). *Nephrodium boryanum* (Willd.) Baker: 284 (1867d). *Dryopteris boryana* (Willd.) C.Chr.: 255 (1905). *Athyrium boryanum* (Willd.) Tagawa: 144 (1935). *Dryoathyrium boryanum* (Willd.) Ching: 81 (1941b); Schelpe: 207 (1970); Schelpe & Diniz: 223 (1979); Jacobsen: 441 (1983); Schelpe & Anthony: 229 (1986); Burrows: 278 (1990). *Ctenitis boryana* (Willd.) Copel.: 123 (1947). *Cornopteris boryana* (Willd.) Tardieu: 32 (1958b). *Parathyrium boryanum* (Willd.) Holttum: 449 (1959), nom. superfl. *Lunathyrium boryanum* (Willd.) H.Ohba: 53 (1965). Type: Habitat in sylvis insulae Borboniae, Bory de St. Vincent s.n. (P, iso.).

**ILLUSTRATIONS:** Fig. 15F & G; Schelpe: t. 59, fig. 1, 2 (1970).

Terrestrial, mostly along streams in deeply shaded evergreen forests, 1 100–1 700 m.

**DISTRIBUTION:** Bioko, Cameroon, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region and Asia.

2. Section **Athyriopsis** (Ching) M.Kato in Journal of the Faculty of Science, University of Tokyo. Sect. 3, Bot. 13: 401 (1984). *Athyriopsis* Ching: 63 (1964). *Lunathyrium* Koidz. sect. *Athyriopsis* (Ching) H.Ohba: 52 (1965). Type: *Deparia japonica* (Thunb.) M.Kato; *Asplenium japonicum* Thunb.

This section is divided into two subsections (Kato 1984). *Deparia japonica* belongs to subsection *Athyriopsis*.

\***Deparia japonica** (Thunb.) M.Kato in Botanical Magazine (Tokyo) 90: 37 (1977). *Asplenium japonicum* Thunb.: 334 (1784). *Diplazium japonicum* (Thunb.) Bedd.: 12 (1876), nom. tantum. *Athyrium japonicum* (Thunb.) Copel.: 290 (1908). *Lunathyrium japonicum* (Thunb.) Sa.Kurata: 99 (1961); Jacobsen: 406 (1983); Schelpe & Anthony: 225 (1986); Burrows: 274 (1990). *Athyriopsis japonica* (Thunb.) Ching: 65 (1964). Type: Crescit in montibus Nagasaki, sine coll. s.n. (missing).

**ILLUSTRATIONS:** Fig. 15H–K; Burrows: t. 66, fig. 280, 280a (1990).

Terrestrial, moderately to deeply shaded in moist disturbed forests, 700–800 m.

**DISTRIBUTION:** South Africa, naturalized in KwaZulu-Natal. Native to the Himalayas, central and south-western China, Korea and Japan.

**0195100 CYSTOPTERIS** Bernh. in Neues Journal für die Botanik 1: 5, 26 (1806), nom. cons. Type: *Cystopteris fragilis* (L.) Bernh.; *Polypodium fragile* L.

*Filix* Adans.: 20, 558 (1763). Type: *Cystopteris fragilis* (L.) Bernh., *Polypodium fragile* L.

Plants terrestrial or epilithic. *Rhizome* dictyostelic, short-decumbent. *Fronds* monomorphic, approximate; stipe and rachis shallowly sulcate adaxially, with a central ridge, secondary axes not sulcate; lamina pinnately compound; hypostomatic, stomata mostly of the polocytic type; venation free, pinnately branched, ending near the margin, anadromous. *Indumentum* composed of narrow paleae and hairs often bearing small, cylindrical, unicellular thin-walled cells superficially, the apex always terminating in a large, variably shaped gland-like cell, occurring on the rhizome and axes. *Sori* circular, dorsal, medial on the acroscopic branch of a forked vein; sporangium stalk simple, 3-seriate below the capsule, capsule globose, with 17–23 indurated annulus cells and a well defined stomium; indusium small, elliptic, inferior, with cylindrical, unicellular glands along the margin, also with hairs superficially. *Spores* ellipsoidal, monolete, echinate, 28–55 µm long. *Gametophyte*: mature thallus cordate, with a thick central cushion and uplifted wings, with unicellular glandular hairs on the surfaces and margin; antheridium 3-celled, the basal cell funnel-shaped, dehiscing by the collapse of the cap cell; archegonium with 4–5 tiers of cells, curved towards the posterior, neck canal cell binucleate. Chromosome number based on  $2n = 84$ .

A genus of approximately 12 species in temperate zones and alpine regions of the tropics.

**Cystopteris fragilis** (L.) Bernh. in Neues Journal für die Botanik 1: 27, t. 2, fig. 9 (1806); Sim: 66 (1892); Sim: 88 (1915); Jacobsen: 402 (1983); Schelpe & Anthony: 229 (1986); Burrows: 279 (1990). *Polypodium fragile* L.: 1091 (1753). *Cyathea fragilis* (L.) Sm.: 417 (1793). *Aspidium fragile* (L.) Sw.: 40 (1801). *Athyrium fragile* (L.) Spreng.: 136 (1804). *Cyclopteris fragilis* (L.) Gray: 9 (1821). *Cystea fragilis* (L.) Bernh.: 26 (1806). *Filix fragilis* (L.) Underw.: 119 (1900). Type: Habitat in collibus Europae frigidioris, *Herb. Sloane* 96, fol. 40 (BM, holo.).

**ILLUSTRATIONS:** Fig. 15L–N; Burrows: t. 65, fig. 284 (1990).

Terrestrial, in rock crevices and at boulder bases in montane grasslands, exposed or shaded, 1 000–3 350 m.

**DISTRIBUTION:** Bioko, Cameroon, Kenya, Lesotho, South Africa and Tanzania. Also in the Madagascan region, panboreal.

**0195400 HYPODEMATIUM** Kunze in Flora 16: 690 (1833). Type: *Hypodematium onustum* Kunze (now *Hypodematium crenatum* (Forssk.) Kuhn; *Polypodium crenatum* Forssk.).

Plants terrestrial. *Rhizome* a dorsiventral dictyostele, short-decumbent. *Fronds* monomorphic, approximate; stipe base swollen, adaxially sulcate, sulci of the axes continuous; lamina pinnately compound, the basal pinna pair basiscopically developed; hypostomatic, stomata of the polocytic type; venation free, branches simple or forked, ending near the margin, anadromous. *Indumentum* composed of narrow, entire paleae occurring on the rhizome and stipe base, and acicular and glandular hairs occurring

along the axes and lamina surfaces. *Sori* circular, dorsal or at a vein bifurcation; sporangium stalk simple, 3-seriate below the capsule; capsule with 16–20 indurated annulus cells; indusium reniform, with acicular hairs dorsally and along the margins. *Spores* ellipsoidal, monolet, tuberculate, 38–55 µm long. *Gametophyte*: mature thallus cordate, profusely hairy on all the surfaces and margin, hairs unicellular, papillate, secretory and elongated, non-secretory, rhizoid-like hairs occur superficially and along the margins at anterior end; antheridium dehiscing by the collapse of the cap cell. Chromosome number based on  $2n = 80$  or 82.

A genus of four species confined to southern and western Africa and East Asia.

**Hypodematium crenatum** (Forssk.) Kuhn, In Cl. v. d. Decken, Reisen Ost-Afrikas in 1851–1861, 3: 37 (1879); Schelpe: 230 (1970); Schelpe: 176 (1977); Jacobsen: 451 (1983); Schelpe & Anthony: 263 (1986); Burrows: 320 (1990). *Polypodium crenatum* Forssk.: CXXV, 185 (1775). *Aspidium crenatum* (Forssk.) Kuhn: 129 (1868). *Lastrea crenata* (Forssk.) Bedd.: 18 (1876). *Nephrodium crenatum* (Forssk.) Baker: 497 (1877b); Sim: 186 (1892). *Dryopteris crenata* (Forssk.) Kuntze: 811 (1891); Sim: 111 (1915). Type: In montium Yemen ad Balghose, Forsskål s.n. (missing).

var. **crenatum**

**ILLUSTRATION**: Schelpe: t. 32, fig. 1–4 (1977).

Epilithic, exposed or partially shaded in grassland and scrub, 1 400–1 800 m.

**DISTRIBUTION**: Angola, Kenya, Mozambique, South Africa and Zambia.

var. **loyalii** Fraser-Jenk. & Khullar is confined to Uttar Pradesh in India.

**0195500 WOODSIA** R.Br., Prodromus florae Novae-Hollandiae et insulae Van-Diemen: 158 (1810). Lectotype: *Woodsia ilvensis* (L.) R.Br.; *Acrostichum ilvense* L., designated by J. Smith (1875).

Plants terrestrial or epilithic. *Rhizome* dictyostelic, short-decumbent. *Fronde*s monomorphic, approximate; stipe and rachis adaxially sulcate, not open to the sulci of the costae; lamina pinnately compound; hypostomatic, stomata of the polocytic type; venation free, anadromous, pinnately branched, ending near the margin. *Indumentum* composed of narrow, centrally densely lignified paleae bearing unicellular thin-walled cells and often also long outgrowths along the margin occurring on the rhizome and the stipe base, also with unicellular glands, acicular hairs and acicular hairs ending in a glandular cell occurring along the axes and lamina surfaces. *Sori* circular, dorsal; sporangium short-stalked, simple; capsule globose, with 16–19 indurated annulus cells and a well defined stomium; indusium cup-shaped, with unicellular thin-walled cells along the margin. *Spores* ellipsoidal, monolet, with echinulate folds, 58–62 µm long. *Gametophyte*: mature thallus epigeal, cordate, with a central cushion and wings one cell layer thick, with unicellular glandular cells along the margin and superficially; antheridium 3-celled, the basal cell funnel-shaped, the cap cell divided into a circular cell and a sickle-shaped cell; archegonium with 5 tiers of neck cells, the neck canal cell binucleate. Chromosome number based on  $2n = 76$  or 82.

A genus of approximately 30 species widespread in the north-temperate zone and mountainous regions of South America and southern Africa. A subgeneric classification is provided by Ma (1985). Following this system, the southern African species fall within section *Perrinia* Hook. characterized by a non-articulated stipe, the presence of cylindrical or capitate hairs, the absence of a false indusium and a chromosome number based on  $2n = 76$ .

Section **Perrinia** Hook., Species filicum 1: 62 (1844). Lectotype: *Woodsia scopulina* D.C. Eaton, designated by Tagawa (1937).

#### KEY TO THE SPECIES:

Stipe with numerous persistent paleae at the base; pinnatifid segments widely spaced, not overlapping ..... 1. **W. angolensis**  
Stipe without numerous persistent paleae at the base; pinnatifid segments closely spaced or overlapping ..... 2. **W. montividentis**

1. **Woodsia angolensis** Schelpe in Garcia de Orta, Sér. Bot. 3: 53 (1976); Schelpe: 173 (1977); Schelpe & Anthony: 241 (1986); Burrows: 298 (1990). Type: Angola, Huila, Lubango, Tundavala (Serra da Chela) ao quilómetro 18 da escarpa rochosa junto à fenda, 30/04/1971, A. Borges 131 (LISC, holo.; COL, LUAL, iso.).

**ILLUSTRATION**: Schelpe: t. 31, fig. 1, 2 (1977).

Terrestrial, at boulder bases in montane grassland, exposed or partially shaded, 1 600–2 300 m.

**DISTRIBUTION**: Angola and South Africa.

2. **Woodsia montividentis** (Spreng.) Hieron. in Botanische Jahrbücher für Systematik 22: 363 (1897); Brown: 87 (1964). Type: Monte Video, Sello 517 (B, holo.).

*Woodsia burgessiana* Gerr. ex Hook. & Baker: 48 (1866); Sim: 61 (1892); Sim: 86 (1915). *Woodsia montividentis* (Spreng.) Hieron. var. *burgessiana* (Gerr. ex Hook. & Baker) Schelpe: 138 (1969a); Jacobsen: 430 (1983); Schelpe & Anthony: 241 (1986); Burrows: 297 (1990). Type: Natal, near the Tugela River, Gerrard & McKen s.n. (K!, holo.; S, SAM!, TCD, iso.).

**ILLUSTRATIONS**: Fig. 150–S; Schelpe & Anthony: t. 82, fig. 1, 1a (1986).

Terrestrial or epilithic, at boulder bases, in rock overhangs and on cliffs in montane regions, 1 500–3 000 m.

**DISTRIBUTION**: Lesotho, South Africa and Zimbabwe. Also in Madagascar, North America and South America from Colombia to Argentina, Uruguay and eastern Brazil.

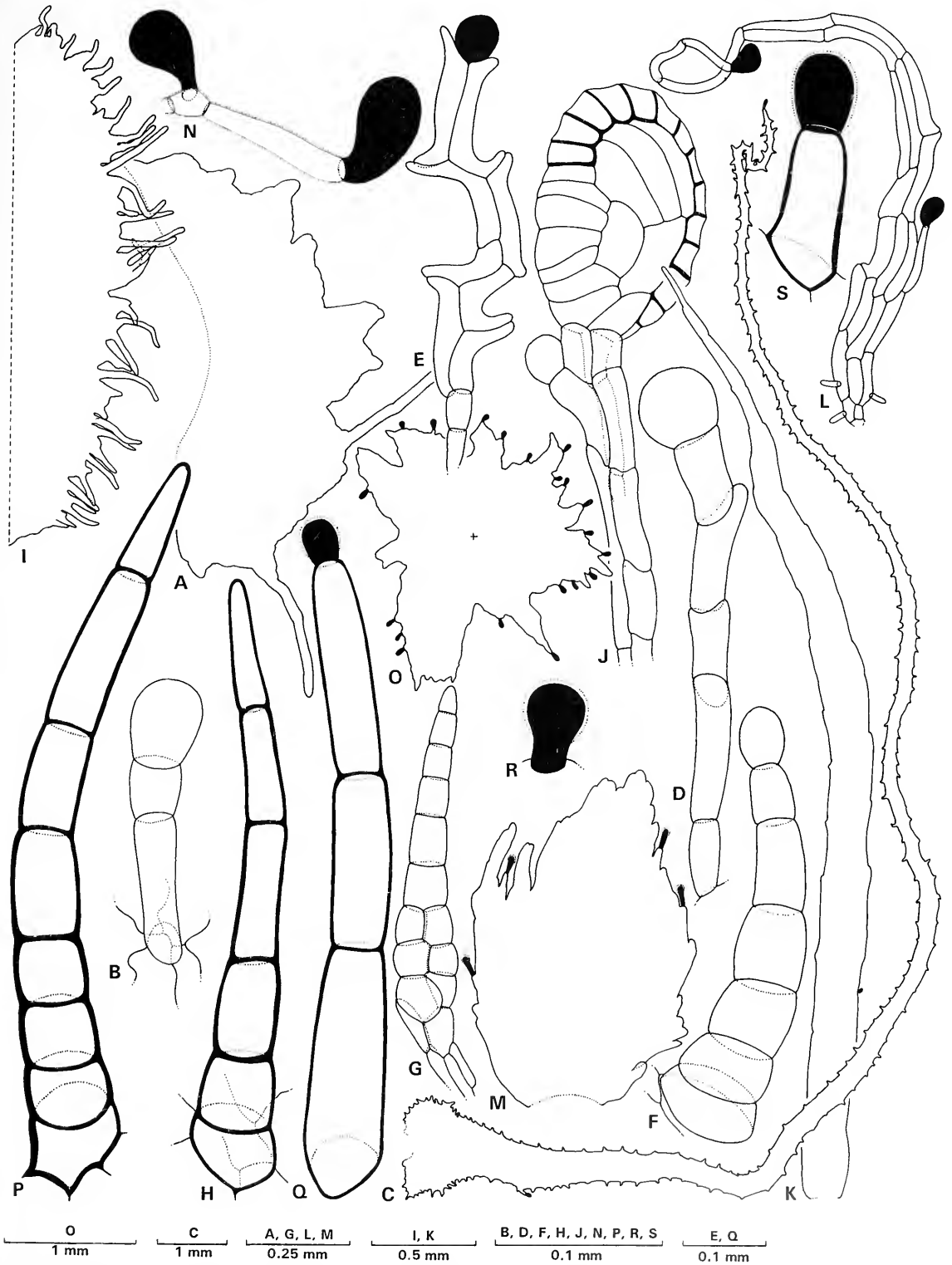


FIGURE 15A–S, Woodsiaceae. A & B, *Athyrium scandinicum*, A, indusium; B, hair along a vein, Kluge 2296 (NBG); C–E, *Diplazium zanzibanicum*, C, stipe base palea; D, hair from the abaxial surface of the lamina; E, hair from the stipe base, Roux 2562 (NBG); F & G, *Deparia boryana*, F, hair from the abaxial surface of the lamina; G, hair from the adaxial surface of the lamina, Burrows 1674 (NBG); H–K, *Deparia japonica*, H, hair from the adaxial surface of the lamina; I, indusium; J, sporangium; K, stipe base palea, Van Jaarsveld 5907 (NBG); L–N, *Cystopteris fragilis*, L, stipe base palea; M, indusium; N, rachis hair, Roux 2223 (NBG); O–S, *Woodsia montivdensis* subsp. *burgessiana*, O, indusium; P, hair from the adaxial surface of the lamina; Q, hair from the abaxial surface of the lamina; R, glandular hair from the adaxial surface of the lamina; S, hair from the adaxial surface of the lamina, Roux 956 (NBG). Scale bars: O, 1 mm; C, 1 mm; A, G, L, M, 0.25 mm; I, K, 0.5 mm; B, D, F, H, J, N, P, R, S, 0.1 mm; E, Q, 0.1 mm.

29. **OLEANDRACEAE** (J.Sm.) Ching ex Pic.Serm. in Webbia 20: 745 (1965). *Filices* tribus *Oleandreae* J.Sm.: 73 (1866). *Eremobotrya* tribus *Oleandreae* J.Sm.: 77, 80 (1875). *Polypodiaceae* tribus *Oleandreae* (J.Sm.) Diels: 203 (1899). *Davalliaceae* Mett. ex A.B.Frank subfam. *Oleandroideae* (J.Sm.) Crabbe, Jermy & Mickel: 154 (1975), p.p. Type: *Oleandra* Cav.

Plants terrestrial, epilithic or epiphytic. *Rhizome* dictyostelic, scandent or wide-creeping, laterally branched, phyllopodia short or long; roots with an outer parenchymatous cortex and an inner sclerenchymatous cortex. *Fronds* monomorphic, approximate or widely spaced, articulated to a short or long phyllopodium; stipe and rachis or costa adaxially sulcate, not open to the sulci of the lower order axes; lamina simple or pinnately compound, catadromous; hypostomatic, stomata mostly of the anomo-, polo- and copolocytic types; aerophore line dorso-lateral along the stipe and rachis; venation anadromous, free, simple, forked or pinnately branched, ending in or near the margin, apex often thickened or terminating in calcareous hydathodes. *Indumentum* composed of peltate paleae confined to the rhizome, entire, with long filiform outgrowths or with closely spaced, unicellular, thin-walled cells along the margin, also with filiform or acicular, glandular and eglandular hairs along the axes and lamina surfaces. *Sori* circular, dorsally along an acroscopic vein branch; sporangium long-stalked, simple or with glandular cells and/or long filiform hairs, 3-seriate below the capsule; capsule globose, with 12–17 indurated annulus cells and a well defined stomium; indusium reniform, multistratose in *Oleandra*, simple or with marginal and superficial indumentum. *Spores* ellipsoidal, monolete, with prominent folds, 30–50 µm long. *Gametophyte*: spore germination of the *Vittaria*-type; germ filament terminating in a hair prior to or immediately after initiation of plate formation; prothallial development of the *Aspidium*-type; mature thalli cordate, with a thickened central midrib, wings uplifted, hairs superficial and marginal, papillate, chlorophyllous, unicellular or 2–3-celled and branched, glandular or non-secretory; antheridia often borne on the outgrowths, 3-celled, the cap cell often divided; archegonium neck with 4–5 tiers of cells, curved towards the posterior, the apex swollen at maturity, the neck canal cell binucleate. Chromosome number based on  $2n = 80$  or 82

The Oleandraceae as interpreted here have been included in the Davalliaceae by Copeland (1947) and Alston (1956b). The chromosome number based on  $2n = 80$  or 82, together with several anatomical and morphological features as discussed by Nayar *et al.* (1968), suggests an affinity with the dryopteroid ferns.

#### KEY TO THE GENERA:

Lamina simple; veins simple or forked ..... 0196800 **Oleandra**  
Lamina pinnately compound; veins pinnately branched ..... 0196900 **Arthropteris**

**0196800 OLEANDRA** Cav., *Anales de historia natural* 1: 115 (1799). *Aspidium* Sw. subgen. *Oleandra* (Cav.) Splitg.: 411 (1848). Type: *Oleandra neriformis* Cav., corrected by Swartz (1806) to *neriiformis*.

Plants epilithic or epiphytic. *Rhizome* dictyostelic, scandent, laterally branched, phyllopodia long; roots wiry, long and mostly unbranched. *Fronds* monomorphic, approximate to widely spaced, articulated, articulation evident as a swelling; stipe and costa adaxially sulcate; lamina simple, entire; hypostomatic, stomata mostly of the polocytic type; venation anadromous, free, simple or forked, ending in the margin. *Indumentum* composed of peltate paleae with entire or long filiform marginal outgrowths occurring on the rhizome, and sessile paleae with short and/or long marginal outgrowths ending in an oblong cell occurring along the axes and abaxially along the costa, also with long simple multicellular unistratose hairs on the lamina. *Sori* circular, dorsally on the acroscopic vein branch, scattered in a line parallel to the costa; sporangium long-stalked, simple or with one or more glandular cells and/or a long filiform outgrowth, 3-seriate below the capsule; capsule globose, with 12–13 indurated annulus cells and a well defined stomium; indusium reniform, multistratose, entire. *Spores* elliptic, monolete, with wing-like folds, echinate, porate, 30–50 µm long. *Gametophyte*: germ filament terminating in a hair; mature thallus cordate, with a thickened central cushion, hairs superficially and along the margins, papillate, unicellular, non-secretory, chlorophyllous; antheridium often borne on outgrowths, 3-celled, the basal cell often long; archegonium neck with 4 tiers of cells, curved towards the posterior, swollen at maturity, the neck canal cell binucleate. Chromosome number based on  $2n = 82$ .

A genus of approximately 40 species with a pantropical distribution, but mostly in Asia.

#### KEY TO THE SPECIES:

Rhizome paleae appressed, margins long ciliate; lamina oblong-linear ..... 1. **O. distenta**  
Rhizome paleae squarrose, margins entire; lamina oblong-elliptic ..... 2. **O. welwitschii**

1. **Oleandra distenta** Kunze in *Botanische Zeitung* (Berlin) 9: 347 (1851b); Schelpe: 165 (1970); Schelpe: 131 (1977); Schelpe & Diniz: 170 (1979); Jacobsen: 326 (1983); Schelpe & Anthony: 171 (1986); Burrows: 208 (1990). Type: Scandens in rupium fissuris ad Macalisberg, Africae australi-orientalis, Zeyher s.n. (LZ†, holo.); Zeyher 1869 (BM, ?iso.).

*Oleandra densifrons* Kunze: 347 (1851b). Type: Port Natal, inter Omfondi et Tagela, Gueinzus s.n. (LZ†, holo.); Port Natal, Gueinzus s.n. [B, lecto., designated by Schelpe & Anthony (1986)].

*Oleandra articulata* sensu Sim: 189 (1892); Sim: 124 (1915).

**ILLUSTRATIONS:** Fig. 16A & B; Schelpe: t. 51, fig. 1, 2 (1970).

Epilithic or epiphytic, in crevices of boulders in montane grassland, on cliff faces, near waterfalls, in rock overhangs and as high-level epiphyte in moist evergreen forests, 50–2 000 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Príncipe, Rwanda, São Tomé, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

2. **Oleandra welwitschii** (Baker) Pic.Serm. in Webbia 20: 764 (1965). *Oleandra articulata* (Sw.) C.Presl var. *welwitschii* Baker: 303 (1867d). Type: Iter Angolense, reg. Illa sup. 3 800–5 500 p. alt., Dist. Huíla, habit rarior in sylvia agri Loppollensis, truncos vetustos arborum mire decorans, Febr. 1860, *Welwitschii* 188 (K, holo.; BM, LISC, iso.).

Epilithic, on seasonally moist rock faces in evergreen forests.

**DISTRIBUTION:** Angola, Congo and Democratic Republic of the Congo.

**0196900 ARTHROPTERIS** *J.Sm. ex Hook.f., Flora novae-zelandiae* 2: 43, t. 82 (1854). Type: *Arthropteris tenella* (G.Forst.) J.Sm. ex Hook.f.; *Polypodium tenellum* G.Forst.

Plants terrestrial, epilithic or epiphytic. *Rhizome* dictyostelic, widely creeping, laterally branched, with short or long phyllopodia. *Fronde* monomorphic, approximate to widely spaced, articulated; stipe and rachis adaxially sulcate, sulcus not open to the sulci of the lower order axes; lamina pinnately compound, catadromous; hypostomatic, stomata of the anomo-, polo- and copolocytic types; aerophore line dorso-lateral along the stipe and rachis; venation free, pinnately branched, ending in a thickened apex or calcareous hydathodes near the margin. *Indumentum* composed of near circular peltate paleae with closely spaced, unicellular, thin-walled cells along the margin, occurring on the rhizome, and acicular, glandular and eglandular hairs along the axes and lamina surfaces. *Sori* circular, dorsal on the acroscopic vein branch; sporangium long-stalked, simple, 3-seriate below the capsule; capsule globose, with 13–17 indurated annulus cells and a well defined stomium; indusium reniform, with numerous unicellular thin-walled cells along the margin and glandular cells on the adaxial surface. *Spores* ellipsoidal, monolete, with inflated folds, 40–42 µm long. *Gametophyte*: mature thallus cordate with a well developed midrib and broad wings, hairs superficial and along the margins, unicellular, papillate, secretory, also with small unbranched, multicellular hairs along the margins and large branched hairs on the ventral surface; antheridium 3-celled, the basal cell often slightly elongated, dehiscing by a pore in the cap cell; archegonium with a neck 4–5 tiers high, curved towards the posterior, the neck canal cell binucleate. Chromosome number based on  $2n = 82$ .

A genus of approximately 15 species with a palaeotropical distribution.

#### KEY TO THE SPECIES:

- 1a Terminal pinna resembling lateral pinnae; lateral pinnae acroscopically auricled ..... 3. **A. palisotii**  
 1b Terminal pinnae not resembling lateral pinnae; lateral pinnae not acroscopically auricled:  
 2a Stipe articulated in the lower half; calcareous hydathodes absent on the ventral surface of the pinnae ..... 1. **A. monocarpa**  
 2a Stipe articulated in the upper half; calcareous hydathodes present on the ventral surface of the pinnae ..... 2. **A. orientalis**

1. **Arthropteris monocarpa** (Cordem.) C.Chr., In H. Perrier, Catalogue des plantes de Madagascar, Pteridophyta: 32 (1932a); Schelpe: 163 (1970); Schelpe: 129 (1977); Schelpe & Diniz: 169 (1979); Jacobsen: 324 (1983); Schelpe & Anthony: 170 (1986); Burrows: 207 (1990). *Nephrodium monocarpum* Cordem.: 186 (1891). Type: Crescit in insula Borboniae, sine coll. s.n. [P!, neo., designated by Pichi Sermolli (1978b)].

*Nephrodium albo-punctatum* sensu Sim: 173 (1892).

*Dryopteris orientalis* sensu Sim: 91 (1915), p.p.

**ILLUSTRATIONS:** Fig. 16C–H; Schelpe: t. 50, fig. 1, 2 (1970).

Terrestrial, epilithic or epiphytic, in seasonally dry miombo woodland, along shaded streambanks and in moist evergreen forests, 700–2 100 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Príncipe, Rwanda, São Tomé, Sierra Leone, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

2. **Arthropteris orientalis** (J.F.Gmel.) Posth. in Recueil des Travaux Botaniques Néerlandais 21: 218 (1924); Schelpe: 163 (1970); Schelpe: 130 (1977); Schelpe & Diniz: 168 (1979); Jacobsen: 325 (1983); Burrows: 207 (1990). *Polypodium orientale* J.F.Gmel.: 1312 (1791). *Dryopteris orientalis* (J.F.Gmel.) C.Chr.: 281 (1905). Type: Montibus Hadiensibus, ad Bolghose, mense martii 1763, *Forsskål s.n.* [C., Herb. Forsskål no. 807, lecto., designated by Pichi Sermolli (1978b)].

var. **orientalis**

**ILLUSTRATION:** Alston: t. 12, fig. A–F (1959).

Terrestrial, epilithic or epiphytic, in exposed or deeply shaded shallow soil pockets on rock outcrops, seasonally moist miombo woodland, and moist evergreen forests, 750–2 100 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Burundi, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Príncipe, Rwanda, São Tomé, Sierra Leone, Sudan, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

var. **humblotii** (Baker) Pic.Serm. is confined to the Comoro Islands and var. **subbiaurita** (Hook.) C.Chr. to Madagascar, Réunion and Mauritius.

3. **Arthropteris palisotii** (Desv.) Alston in Boletim da Sociedade Broteriana, Sér. 2, 30: 6 (1956a); Schelpe: 129 (1977). *Aspidium palisotii* Desv.: 320 (1811). Type: Habitat in ovariense africes, *Palisot de Beauvois s.n.* (P, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 15, fig. 1, 2 (1964a).

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Nigeria, Senegal, São Tomé, Tanzania and Uganda.

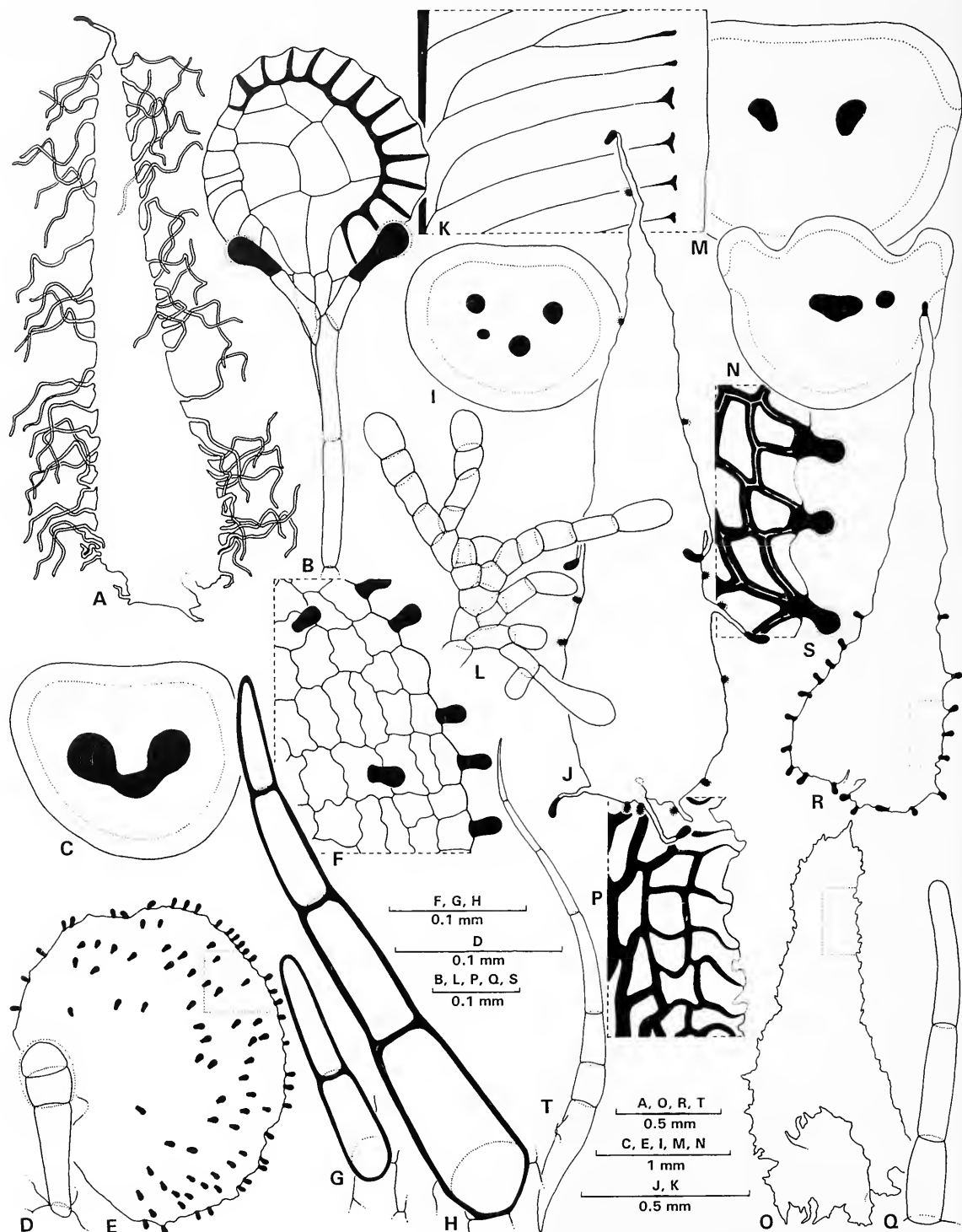


FIGURE 16A–T, Oleandraceae, Lomariopsidaceae, Aspleniaceae and Marsileaceae. A & B, *Oleandra distenta*, A, rhizome palea; B, sporangium, Roux 900 (NBG); C–H, *Arthropteris monocarpa*, C, cross section of stipe; D, glandular hair from abaxial surface of lamina; E, indusium; F, section of E showing cellular structure; G, hair from abaxial surface of lamina; H, hair from adaxial surface of lamina, Roux 1937 (NBG); I–L, *Elaphoglossum acrostichoides*, I, cross section of stipe; J, stipe palea; K, venation; L, branched hair from abaxial surface of lamina, Roux 1464 (NBG); M & N, *Asplenium boltonii*, M, cross section of stipe; N, cross section of rachis, exhort; O–Q, *A. protensum*; O, stipe palea; P, section of O showing cellular structure; Q, rachis hair, Roux 2708 (NBG); R & S, *Asplenium cordatum*, R, palea from abaxial surface of lamina; S, section of R showing cellular structure, Roux 2448 (NBG); T, *Marsilea schelpeana*, sporocarp hair, Van Jaarsveld 4982 (NBG). Scale bars: C, E, I, M, N, 1 mm; J, K, 0.5 mm; A, O, R, T, 0.5 mm; D, 0.1 mm; F, G, H, 0.1 mm; B, L, P, Q, S, 0.1 mm.

30. **LOMARIOPSIDACEAE** *Alston* in *Taxon* 5: 25 (1956b). *Aspleniaceae* Mett. ex A.B.Frank subfam. *Lomariopsidaceae* (Alston) Crabbe, Jermy & Mickel: 154 (1975). Type: *Lomariopsis* Fée.

*Elaphoglossaceae* Pic.Serm.: 209 (1968b). *Aspleniaceae* Mett. ex A.B.Frank subfam. *Elaphoglossaceae* (Pic.Serm.) Crabbe, Jermy & Mickel: 154 (1975). Type: *Elaphoglossum* Schott ex J.Sm.

*Lomariopsidaceae* Alston tribus *Bolbitideae* Pic.Serm.: 381 (1969). *Bolbitideae* (Pic.Serm.) Ching: 16 (1978a). Type: *Bolbitis* Schott.

Plants terrestrial, epilithic or epiphytic. *Rhizome* dictyostelic, short and suberect, or creeping and branched, often dorsiventral, often with prominent pneumatophores, phyllopodia if present, then short or long, proximally or widely spaced; roots with a parenchymatous outer cortex and a sclerenchymatous inner cortex, often with passage cells. *Fronde*s dimorphic, proximally or widely spaced, articulated at the stipe base or not; stipe and rachis adaxially sulcate or convex and then with lateral ridges; lamina simple or pinnately compound, often with proliferating buds along the rachis; pinnae sessile, articulated but non-functional; hypostomatic, stomata of the actino- and polycytic type; aerophores in dorsolateral lines along the stipe; venation free or anastomosing, if reticulate then with or without included veinlets, isodromous or catadromous. *Indumentum* composed of sessile or short-stalked, broadly attached to peltate paleae, or often with glandular hairs or thin-walled cells along the margin and rarely superficially, the apex ending in a thin-walled cell or a subulate cell occurring on the rhizome, axes and lamina surfaces and short, uniseriate epidermal hairs. *Sporangia* amassed along the veins or acrostichoid, stalk slender, simple, 3-seriate below the capsule, capsule with 11–19 indurated annulus cells and a well defined stomium; exindusiate. *Spores* ellipsoidal, monolet, with prominent folds, 20–78  $\mu$ m long. *Gametophyte*: spore germination of the *Vittaria*-type; prothallial development of the *Drynaria*-type, of *Aspidium*-type in *Elaphoglossum*; mature thallus strap-shaped, with a thick midrib or thin and discontinuous, wings flat, one cell layer thick, meristem situated in the anterior sinus or poorly defined; glabrous or with unicellular papillate secretory hairs superficially and along the margins, profusely hairy superficially and along the margins, rhizoids marginal or confined to the midrib, brown; antheridium 3-celled, the basal cell disk-shaped, dehiscing by the collapse of the cap cell or by a pore in the cap cell; archegonium neck short, the neck canal cell binucleate. Chromosome number based on  $2n = 82$ .

A family with a pantropical distribution. A close affinity with the Dryopteridaceae is widely accepted and supported by a chromosome number based on  $2n = 82$ . The derivation of the genera (except for *Elaphoglossum*) from the dryopteroid ferns was first postulated by Christensen (1938). Holttum (1947), because of the dorsiventral rhizome, disputes this and suggested a dennstaedtioid origin with a development parallel to that of the dryopteroid ferns.

#### KEY TO THE GENERA:

- 1a Fronds articulated at the stipe base ..... 0198600 **Elaphoglossum**
- 1b Fronds not articulated at the stipe base:
  - 2a Venation free ..... 0198100 **Lomariopsis**
  - 2b Venation reticulate ..... 0198500 **Bolbitis**

**0198100 LOMARIOPSIS** Fée, Mémoires sur les familles des fougères 2: 10, 66 (1845). *Acrostichum* L. sect. *Lomariopsis* (Fée) Hook.: 241 (1864b). *Stenochlaena* J.Sm. sect. *Lomariopsis* (Fée) Underw.: 37 (1906). Type: *Lomariopsis sorbifolia* (L.) Fée; *Acrostichum sorbifolium* L., designated by J. Smith (1875).

Plants epilithic or epiphytic. *Rhizome* dictyostelic, widely creeping, branched. *Fronde*s dimorphic, not articulated; stipe and rachis adaxially sulcate; lamina pinnately compound, pinnae sessile, articulated but non-functional, the costa convex; hypostomatic, stomata mostly of the polycytic type; aerophores in dorsolateral lines along the stipe, extending to the rhizome; venation free, simple or forked, ending in or near the margin, anadromous in the basal pinnae, isodromous or catadromous in the distal pinnae. *Indumentum* composed of sessile, narrow lanceolate paleae with numerous uniseriate outgrowths ending in a thin-walled cell and with unicellular glandular hairs along the margin, the apex ending in a small thin-walled cell occurring on the rhizome, stipe and rachis, and short-stalked, branched hairlike paleae ending in a thin-walled cell occurring along the rachis and costa. *Sporangia* acrostichoid on the fertile pinnae, the stalk slender, 3-seriate below the capsule, capsule globose; exindusiate. *Spores* ellipsoidal, monolet, with prominent wings, 43–57  $\mu$ m long. *Gametophyte* strap-shaped, rhizoids marginal, brown, meristematic region poorly defined. Chromosome number based on  $2n = 82$ .

A genus of approximately 45 species with a pantropical distribution.

#### KEY TO THE SPECIES:

- 1a Sterile fronds simple ..... 4. **L. palustris**
- 1b Sterile fronds 1-pinnate:
  - 2a Fertile pinnae with a sterile apex ..... 2. **L. guineensis**
  - 2b Fertile pinnae without a sterile apex:
    - 3a Fertile frond rachis densely paleated at maturity ..... 3. **L. hederacea**
    - 3b Fertile frond rachis sparsely paleated at maturity:
      - 4a Sterile fronds with up to 10 pinna pairs; pinna apex suddenly contracted to a subcaudate apex ..... 1. **L. congoensis**
      - 4b Sterile fronds with up to 20 pinna pairs; pinna apex gradually acuminate ..... 5. **L. warneckeii**

1. **Lomariopsis congoensis** Holttum in Kew Bulletin 1939: 622, fig. 8, 9 (1940); Schelpe: 168 (1977). Type: Angola, Cabinda, Mayumbo River, Lufo, Gossweiler 8219 (BM, holo.).

ILLUSTRATION: Tardieu-Blot: t. 16, fig. 5 (1953b).

DISTRIBUTION: Angola, Central African Republic, Congo and Uganda.

2. **Lomariopsis guineensis** (Underw.) Alston in Journal of Botany, London 72, Supplement 2: 5 (1934); Schelpe: 166 (1977). *Stenochlaena guineensis* Underw.: 46 (1906). Type: Fernando Po, G. Mann 139 (K, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 16, fig. 6 (1953b).

**DISTRIBUTION:** Angola, Benin, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Nigeria, Príncipe, São Tomé, Sierra Leone, Sudan and Togo.

3. **Lomariopsis hederacea** *Alston* in *Journal of Botany*, London 72, Supplement 2: 5 (1934); Schelpe: 166 (1977). Type: Portuguese Congo: Mayumbe, Rio Lufo, Hombe region, climbing on the trunk of forest trees in shady humid situations, 04/1917, *Gossweiler* 8218 (BM, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 16, fig. 4 (1953b).

Terrestrial, later epiphytic in wet evergreen forests.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Kenya, Nigeria, São Tomé and Tanzania.

4. **Lomariopsis palustris** (*Hook.*) *Mett. ex Kuhn*, *Filices africanæ*: 53 (1868); Schelpe: 166 (1977). *Acrostichum palustre* *Hook.*: 214 (1864b). Type: W Africa, S Nigeria, Onitsha, *Barter* 1452 [K, lecto., designated by Schelpe (1969b)].

**ILLUSTRATION:** Tardieu-Blot: t. 16, fig. 1, 2 (1953b).

Terrestrial, later epiphytic in wet evergreen swamp forests.

**DISTRIBUTION:** Angola, Cameroon, Côté d'Ivoire, Gabon, Ghana, Guinea, Liberia, Nigeria and Sierra Leone.

5. **Lomariopsis warnecke** (*Hieron.*) *Alston* in *Journal of Botany*, London 72, Supplement 2: 6 (1934); Schelpe: 216 (1970); Schelpe & Diniz: 232 (1979); Jacobsen: 427 (1983); Burrows: 293 (1990). *Stenochlaena warnecke* *Hieron.*: 383 (1911). Type: Deutsch-Ostafrika: an Baumstämmen feuchter schattiger Orte der Schluchtenwaldung bei Amani, 03/1903, *Warnecke* 312 (B, holo.).

**ILLUSTRATION:** Schelpe: t. 61, fig. 1, 2 (1970).

Epilithic or epiphytic, in wet conditions in deeply shaded evergreen forests and swamp forests, 100–1 300 m.

**DISTRIBUTION:** Bioko, Burundi, Kenya, Malawi, Mozambique, Príncipe, Rwanda, Tanzania and Zimbabwe.

**0198500 BOLBITIS** *Schott*, *Genera filicum*: 3, t. 14 (1834). Lectotype: *Bolbitis serratifolia* (*Mert. ex Kaulf.*) *Schott*; *Acrostichum serratifolium* *Mert. ex Kaulf.*, designated by Christensen (1905).

Plants terrestrial or epilithic. *Rhizome* a dorsiventral dictyostele, creeping. *Fron*ds dimorphic, approximate; stipe and rachis adaxially flat or convex with two lateral ridges; lamina simple or pinnately compound, often with proliferating buds along the rachis, pinnae proximally short-stalked, broadly attached towards the apex; hypostomatic, stomata of the actino- and polocytic types; aerophores as dorsolateral lines along the stipe and rachis; venation reticulate, areoles with ex- and/or recurrent, simple or forked, free veinlets, anadromous and catadromous. *Indumentum* composed of narrow paleae with short marginal outgrowths ending in a thin-walled cell occurring on the rhizome and stipe, and with few-celled epidermal hairs. *Sporangia* acrostichoid, stalk slender, simple, 3-seriate below the capsule; capsule globose, with 13–19 indurated annulus cells and a well defined stomium; exindusiate. *Spores* ellipsoidal, monolet, perispore smooth, 40–50 x 34–40 µm long. *Gametophyte*: mature thallus cordate or strap-shaped, with a thick midrib and wings one cell layer thick, meristem situated in the anterior sinus; glabrous, with unicellular papillate secretory hairs, or with clavate hairs; antheridium 3-celled, the basal cell disk-shaped, dehiscing by the collapse of the cap cell; archegonium neck short, the neck canal cell binucleate. Chromosome number based on  $2n = 82$ .

A genus of approximately 44 species with a pantropical distribution. The genus is divided into 10 series (Hennipman 1977) with each of the southern African species placed in a different series.

**KEY TO THE SPECIES:** - based on Hennipman (1977).

- 1a Fronds simple ..... 4. **B. gabo**onensis
- 1b Fronds 1-pinnate:
  - 2a Terminal segments with a proliferating bud on the basal part ..... 5. **B. gemmifera**
  - 2b Terminal segment without proliferating buds or buds subterminal:
    - 3a Areoles with excurrent and recurrent included free veins:
      - 4a Proliferating buds absent ..... 6. **B. heudelotii**
      - 4b Proliferating buds subterminal ..... 3. **B. x bovinii**
    - 3b Areoles without or with excurrent free veinlets only:
      - 5a Terminal segments triangular, as long or longer than the remaining part of the lamina ..... 2. **B. auriculata**
      - 5b Terminal segment conform to the pinnae and much shorter than the remaining part of the lamina ..... 1. **B. acrostichoides**

1. **Bolbitis acrostichoides** (*Afzel. ex Sw.*) *Ching*, *Index filicum*, Supplement 3: 47 (1934b); Schelpe: 172 (1977); Hennipman: 149 (1977); Schelpe & Diniz: 234 (1979). *Hemionitis acrostichoides* *Sw.*: 17 (1801). *Polybotrya acrostichoides* (*Sw.*) *Mett. ex Kuhn*: 52 (1868). Type: Sierra Leone, *Afzelius* s.n. p.p. [SPA, lecto., designated by Hennipman (1977); BM, iso.].

**ILLUSTRATION:** Hennipman: t. 38, fig. a–i (1977).



Epilithic, in seasonally moist primary and secondary forests, 0–1 000 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Ghana, Guinea, Liberia, Mozambique, Nigeria, São Tomé, Sierra Leone, Tanzania and Uganda.

2. **Bolbitis auriculata** (Lam.) Ching, Index filicum, Supplement 3: 47 (1934b) et Alston, Journal of Botany, London 72, Supplement 2: 3 (1934); Schelpe: 169 (1977); Hennipman: 136 (1977). *Acrostichum auriculatum* Lam.: 36 (1783). Type: Île de Bourbon, *Sonnerat per Thouin s.n.* (SPA, holo.; C, herb. Vahl, iso.).

**ILLUSTRATION:** Hennipman: t. 34, fig. a–f (1977).

Terrestrial or epilithic, deeply shaded in swamp forests, 0–1 200 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Equatorial Guinea, Guinea, Kenya, Liberia, Nigeria, Príncipe, São Tomé, Sierra Leone, Sudan, Tanzania, Togo and Uganda. Also in the Madagascan region.

3. **Bolbitis x boivinii** (Mett. ex Kuhn) Ching, Index filicum, Supplementum 3: 47 (1934b), p.p.; Hennipman: 288 (1977). *Chrysodium boivinii* Mett. ex Kuhn: 51 (1868), p.p. Type: Angola, Cuanza Norte, Golungo Alto, *Welwitsch 156* [K, lecto., designated by Hennipman (1977); BM, isolecto.].

**ILLUSTRATION:** Hennipman: t. 55, fig. e–h (1977).

Epilithic, along streams in evergreen forests, 700 m.

**DISTRIBUTION:** Angola.

4. **Bolbitis gabooneensis** (Hook.) Alston in Journal of Botany, London 72, Supplement 2: 3 (1934b); Hennipman: 208 (1977); Schelpe: 168 (1977). *Acrostichum gabooneense* Hook.: 270 (1864b). *Chrysodium gabooneense* Kuhn: 51 (1868). Type: Guinea, 'coast', *G. Mann 1049* (K, holo.).

**ILLUSTRATION:** Hennipman: t. 55, fig. a–d (1977).

Terrestrial or epilithic, moist positions in rainforests, 50–500 m.

**DISTRIBUTION:** Angola, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo and Gabon.

5. **Bolbitis gemmifera** (Hieron.) C.Chr., Index filicum, Supplement 3: 48 (1934b); Hennipman: 263 (1977); Schelpe: 172 (1977); Burrows: 294 (1990). *Leptochilis gemmifer* Hieron.: 345, 346 (1911). Type: Angola: im Gebiet von Golungo Alto, *Welwitsch 157b* (B, lecto.), designated by Hennipman (1977).

*Leptochilis gemmifer* Hieron. var. *latipinnatus* Hieron.: 346 (1911), p.p. Type: Kongo-Staat: im Urwald bei Mukenge, 22/11/1881, *Pogge 22* [B, lecto., designated by Hennipman (1977)].

**ILLUSTRATION:** Hennipman: t. 74, fig. a–f (1977).

Epilithic, along rivulets in seasonally moist evergreen forests, 150–1 000 m.

**DISTRIBUTION:** Angola, Burundi, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Guinea, Tanzania, Uganda, Zambia and Zimbabwe.

6. **Bolbitis heudelotii** (Bory ex Fée) Alston in Journal of Botany, London 72, Supplement 2: 3 (1934); Schelpe: 218 (1970); Hennipman: 236 (1977); Schelpe: 170 (1977); Schelpe & Diniz: 233 (1979); Jacobsen: 428 (1983); Schelpe & Anthony: 239 (1986); Burrows: 296 (1990). *Gymnopteris heudelotii* Bory ex Fée: 84 (1845). *Anapausia heudelotii* (Bory ex Fée) C.Presl: 187 (1851). *Acrostichum heudelotii* (Bory ex Fée) Hook.: 264 (1864b). *Chrysodium heudelotii* (Bory ex Fée) Kuhn: 5 (1868). *Leptochilis heudelotii* (Bory ex Fée) C.Chr.: 385 (1906); Sim: 122 (1915). *Campium heudelotii* (Bory ex Fée) Copel.: 396 (1928). Type: Senégambie, Fouladhiallon, *Heudelot 805* (Pl, holo.; B; K, L, iso.).

**ILLUSTRATION:** Hennipman: t. 63, fig. a–i (1977).

Epilithic, aquatic-fluviatile along perennial streams, lightly shaded or exposed, 600–2 400 m.

**DISTRIBUTION:** Angola, Benin, Burundi, Cameroon, Central African Republic, Congo, Coté d'Ivoire, Democratic Republic of the Congo, Gabon, Guinea, Kenya, Malawi, Mozambique, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

**0198600 ELAPHOGLOSSUM** Schott ex J.Sm. in Journal of Botany (Hooker) 4: 148 (1841b), nom. cons. Type: *Elaphoglossum conforme* (Sw.) J.Sm.; *Acrostichum conforme* Sw., type cons.

Plants terrestrial, epilithic or epiphytic. *Rhizome* dictyostelic, short-creeping and laterally branched to suberect, with approximate to closely spaced, short or long phyllopodia, mostly with small pneumatophores. *Fronde*s dimorphic, articulated, the fertile overtopping

the sterile or visa versa; stipe and costa adaxially convex or shallowly sulcate; lamina simple, entire; hypostomatic, stomata mostly of the polycytic type; venation free in sterile fronds, simple or forked, ending near the margin, often in a hydathode, rarely reticulate in fertile fronds. *Indumentum* composed of appressed or subulate, sessile, short-stalked or peltate paleae, often with glandular cells along the margin, or with marginal outgrowths ending in a thin-walled cell, the apex ending in a thin-walled cell or a subulate cell, occurring on the rhizome, the axes and lamina surfaces, the rhizome paleae rarely with superficial unicellular glands. *Sporangia* acrostichoid, stalk slender, simple, 3-seriate below the capsule, capsule globose, with 11–14 indurated annulus cells and a well defined stomium; exindusiate. Spores ellipsoidal, monolet, often with wing-like structures, 22–78 µm long. *Gametophyte*: mature thallus strap-shaped, midrib thin and often discontinuous, wings flat, rhizoids confined to the midrib, profusely hairy superficially and along the margins, hairs unicellular, papillate, secretory; antheridium 3-celled, the basal cell disk-shaped, dehiscing by a pore in the cap cell; archegonium neck short, the neck canal cell binucleate. Chromosome number based on  $2n = 82$ .

A genus of approximately 400 species occurring throughout the temperate and tropical regions of the world, but with the largest diversity of species in the neotropics.

#### KEY TO THE SECTIONS:

- 1a Veins ending short of the margin in conspicuous hydathodes:
  - 2a Lamina paleae subulate ..... 5. sect. **Setosa**
  - 2b Lamina paleae not subulate ..... 2. sect. **Eximia**
- 1b Veins ending at or close to the margin, but never in a hydathode:
  - 3a Lamina glabrous or subglabrous ..... 1. sect. **Elaphoglossum**
  - 3b Lamina paleated:
    - 4a Lamina paleae subulate ..... 4. sect. **Polytrichia**
    - 4b Lamina paleae not subulate ..... 3. sect. **Lepidoglossa**

#### 1. Section **Elaphoglossum**

Subsection **Pachyglossa** Christ, Monographie des genus *Elaphoglossum*: 20 (1899). Lectotype: *Elaphoglossum latifolium* (Sw.) J.Sm.; *Acrostichum latifolium* Sw., designated by Mickel & Atehortúa (1980).

#### KEY TO THE SPECIES:

- 1a Sterile lamina base cuneate, not long attenuate:
  - 2a Sterile lamina apex obtuse:
    - 3a Sterile lamina up to 95 mm long, viscid when young ..... 3. **E. conforme**
    - 3b Sterile lamina up to 330 mm long, not viscid when young ..... 4. **E. lastii**
  - 2b Sterile lamina apex acute to acuminate:
    - 4a Sterile lamina narrowly oblong-acuminate ..... 1. **E. acrostichoides**
    - 4b Sterile lamina narrowly to broadly elliptic ..... 5. **E. macropodium**
- 1b Sterile lamina base long attenuate:
  - 5a Sterile lamina <50 x 10 mm; rhizome long-creeping, c. 1 mm in diameter ..... 6. **E. marojejense**
  - 5b Sterile lamina >50 x 10 mm; rhizome short-creeping, >1 mm in diameter:
    - 6a Stipe paleae linear ..... 8. **E. zambesiaceum**
    - 6b Stipe paleae lanceolate to ovate:
      - 7a Midrib adaxially convex when fresh ..... 2. **E. angustatum**
      - 7b Midrib sulcate when fresh:
        - 8a Sterile lamina up to 350 mm long, narrowly oblong-acuminate ..... 1. **E. acrostichoides**
        - 8b Sterile lamina up to 430 mm long, narrowly oblanceolate-acuminate ..... 7. **E. rhodesianum**

1. **Elaphoglossum acrostichoides** (Hook. & Grev.) Schelpe in Journal of South African Botany 30: 196 (1964); Schelpe: 210 (1970); Schelpe: 164 (1977); Schelpe & Diniz: 225 (1979); Roux: 500 (1982b); Jacobsen: 413 (1983); Schelpe & Anthony: 237 (1986); Burrows: 280 (1990). *Vittaria acrostichoides* Hook. & Grev.: t. 186 (1830c). *Drymoglossum acrostichoides* (Hook. & Grev.) T.Moore: 31 (1857). Type: Cape of Good Hope, 1822, *Carmichael s.n.* (K!, holo.).

*Acrostichum conforme* Sw. var. *angustatum* Kunze: 495 (1836). Type: Promont. Bon. Spei, in *cacumine*, *Bergius s.n.* [B!, lecto., designated by Roux (1986); G!, Burchell, Geographicus Plantarum Africae Australis Extratropicae no. 479, syn.].

*Elaphoglossum petiolatum* var. *rupestre* sensu Sim: 288 (1915).

ILLUSTRATIONS: Fig. 161–L; Roux: t. 9 (1982b).

Terrestrial, epilithic or epiphytic, moist or seasonally moist rock faces, among boulders in screes and forests, exposed or deeply shaded, 50–2 350 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Guinea, Kenya, Lesotho, Liberia, Malawi, Mozambique, Rwanda, São Tomé, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe. Also in the Madagascar region.

2. **Elaphoglossum angustatum** (Schrad.) Hieron. in Botanische Jahrbücher für Systematik 46: 404 (1911); Roux: 510 (1982b); Jacobsen: 417 (1983); Schelpe & Anthony: 237 (1986); Burrows: 286 (1990). *Acrostichum angustatum* Schrad.: 915 (1818). *Olfersia angustata* (Schrad.) C.Presl: 234 (1836). Type: Cap. b. Sp., *M. Hesse s.n.* (GOET!, holo.; LE, iso.).

*Acrostichum conforme* Sw. var. *schraderei* Fée: 31 (1845). Type: Habitat in Capite promontori bonae spei, Zeyher, Ecklon & Krauss *s.n.* (not located).

*Elaphoglossum conforme* (Sw.) J.Sm. var. *latifolium* Sim: 286 (1915). Type: Natal, from Kranzklouf through inner Inanda and Noodsberg to Umpumulo, 1 500 to 2 500 ft, *Buchanan s.n.* [NH!, lecto., designated by Roux (1982b); K!, isolecto.]; Natal, hanging from rocks in crowded masses in midland districts, *Medley Wood s.n.* (PRE, syn.); Rhodesia, Mount Pene, 7 000 ft, *Swynerton 6009* (not located)].

**ILLUSTRATION:** Roux: t. 12 (1982b).

Epilithic or epiphytic, in moist evergreen forests and on cliff faces, deeply shaded, 100–800 m.

**DISTRIBUTION:** South Africa.

3. ***Elaphoglossum conforme*** (Sw.) J.Sm. in *Journal of Botany* (Hooker) 4: 148 (1841b); Roux: 495 (1982b); Jacobsen: 416 (1983); Schelpe & Anthony: 235 (1986); Burrows: 284 (1990). *Acrostichum conforme* Sw.: 10, 192 (1806); Sim: 219 (1892); Sim: 285 (1915). *Offeria conformis* (Sw.) C.Presl: 234 (1836). Type: Habitat in Insula St Helenae, *Masson s.n.* (UPS-THUNB 244051, holo.).

*Acrostichum oblongum* Desv.: 308 (1811). Type: Habitat ad C. bonae Spei, *sine coll. s.n.* (P!, holo.).

*Acrostichum glandulosum* Carm. ex Hook. & Grev.: t. 3 (1827). *Acrostichum conforme* Sw. var. *glandulosum* (Carm. ex Hook. & Grev.) Fée: 31 (1845). Type: Cape of Good Hope, 1822, *Carmichael s.n.* (K!, holo.).

*Acrostichum viscosum* Sw. var. *rupestre* Sim: 222 (1892), p.p. *Elaphoglossum petiolatum* (Sw.) Urban var. *rupestre* (Sim.) Sim: 288 (1915). Type: Table Mountain, *Bolus 3899 p.p.* [BOL, lecto., designated by Schelpe & Anthony (1986)].

**ILLUSTRATION:** Roux: t. 7 (1982b).

Epilithic, in seasonally dry shallow soil pockets on rocks and rock crevices in ravines, exposed or shaded, 600–1 000 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Liberia, South Africa, Tanzania, Uganda and St Helena.

4. ***Elaphoglossum lastii*** (Baker) C.Ch., *Index filicum*: 309 (1905); Schelpe: 211 (1970); Schelpe & Diniz: 227 (1979); Jacobsen: 418 (1983); Burrows: 283 (1990). *Acrostichum lastii* Baker: 491 (1891). Type: Mainland west of Zanzibar, 03/1885, *Last s.n.* (K!, holo.).

**ILLUSTRATION:** Pichi Sermolli: t. 3, fig. A–C (1968b).

Epilithic or high-level epiphyte in moist evergreen forests, shaded, 1 370–1 850 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Mozambique, Pemba, Tanzania and Zimbabwe.

5. ***Elaphoglossum macropodium*** (Fée) T.Moore, *Index filicum*: 11 (1857); Schelpe: 211 (1970); Schelpe & Diniz: 226 (1979); Roux: 506 (1982b); Jacobsen: 419 (1983); Schelpe & Anthony: 233 (1986); Burrows: 282 (1990). *Acrostichum macropodium* Fée: 30 (1845). Type: Habitat in Borbonia ad arborum truncos annosos et lapides muscosas, *Bory de St. Vincent s.n.* (P!, holo.).

*Acrostichum latifolium* sensu Sim: 220 (1892).

**ILLUSTRATION:** Schelpe & Anthony: t. 79 (1986).

Epilithic or epiphytic, partially shaded in rock crevices or in deeply shaded wet forests, 50–1 800 m.

**DISTRIBUTION:** Malawi, Mozambique, South Africa, Tanzania and Zimbabwe. Also in the Mascarene region.

6. ***Elaphoglossum marojejense*** Tardieu, *Mémoires de l'Institut Scientifique de Madagascar, Sér. B. Biologie végétale* 6: 238, t. 8, fig. 1–4 (1955); Schelpe: 210 (1970); Burrows: 281 (1990). Type: Madagascar. Contre forts du Marojej, près du col de Doanyanala, 900–1 000 m, sur latérite de gneiss, *Humbert 23105* (P, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 8, fig. 1–4 (1955).

Terrestrial or epilithic, in moss beds and rock crevices, exposed or shaded, 1 830–2 540 m.

**DISTRIBUTION:** Mozambique and Zimbabwe. Also in Madagascar.

7. ***Elaphoglossum rhodesianum*** Schelpe, *Boletim da Sociedade Broteriana, Sér. 2*, 41: 213 (1967); Schelpe: 211 (1970). Type: Zambia, Shiwa Ngandu, evergreen swamp forest, 5 400 ft, 21/07/1938, *Greenway 5449* (K!, holo.; EAH, iso.).

**ILLUSTRATION:** Schelpe: t. 60, fig. 1 (1970).

Terrestrial in evergreen swamp forests, deeply shaded, 1 200–1 500 m.

**DISTRIBUTION:** Democratic Republic of the Congo and Zambia.

8. ***Elaphoglossum zambesiicum*** Schelpe, *Boletim da Sociedade Broteriana, Sér. 2*, 41: 214 (1967); Schelpe: 210 (1970). Type: Zambia, Luwingu, *Franshawe 8708* (SRGH!, holo.).

Terrestrial or epilithic, on streambanks in seasonally moist miombo woodland, 800–1 100 m.

**DISTRIBUTION:** Democratic Republic of the Congo and Zambia.

2. Section **Eximia** Mickel & Atehortúa in American Fern Journal 70: 65 (1980). Type: *Elaphoglossum eximium* (Mett.) Christ; *Acrostichum eximium* Mett.

#### Subsection **Eximia**

**Elaphoglossum aubertii** (Desv.) T.Moore, Index filicum: 5 (1857); Sim: 289 (1915); Schelpe: 213 (1970); Schelpe & Diniz: 228 (1979); Roux: 519 (1982b); Jacobsen: 421 (1983); Schelpe & Anthony: 231 (1986); Burrows: 291 (1990). *Acrostichum aubertii* Desv.: 309 (1811); Sim: 223 (1892). Type: Habitat in insula Borboniae, *Aubert du Petit-Thouars s.n.* (P!, holo.).

**ILLUSTRATION:** Burrows: t. 68, fig. 296, 296a (1990).

Epilithic or epiphytic, deeply shaded moist evergreen forests, 1 300–2 250 m.

**DISTRIBUTION:** Bioko, Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Kenya, Liberia, Malawi, Mozambique, Rwanda, São Tomé, South Africa, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

3. Section **Lepidoglossa** Christ, Monographie des genus *Elaphoglossum*: 21 (1899). Lectotype: *Elaphoglossum paleaceum* (Hook. & Grev.) Sledge; *Acrostichum paleaceum* Hook. & Grev.

#### KEY TO THE SUBSECTIONS:

- 1a Lamina glabrous or paleated; lamina paleae often modified to stellate hairs and/or resinous dots ..... 3. subsect. **Pilosoa**
- 1b Lamina densely paleated; lamina paleae lanceolate, dentate, not stellate or reduced to resinous dots:
  - 2a Lamina ovate-lanceolate, coriaceous, the apex often obtuse; lamina paleae erose ..... 2. subsect. **Musciosa**
  - 2b Lamina linear-lanceolate or narrowly elliptic, apex acuminate; lamina paleae lanceolate, ciliolate .... 1. subsect. **Lepidoglossa**

#### 1. Subsection **Lepidoglossa**

*Elaphoglossum* Schott ex J.Sm. subsect. *Polylepidea* Christ, Monographie des genus *Elaphoglossum*: 21 (1899). Type: *Elaphoglossum paleaceum* (Hook. & Grev.) Sledge; *Acrostichum paleaceum* Hook. & Grev.

#### KEY TO THE SPECIES:

- 1a Rhizome paleae ciliate ..... 1. **E. deckenii**
- 1b Rhizome paleae serrate to subentire:
  - 2a Lamina paleae imbricate, oblong, 1–2 mm long ..... 2. **E. kuhnii**
  - 2b Lamina paleae not imbricate, rounded, 1 mm or less in diameter ..... 3. **E. welwitschii**

1. **Elaphoglossum deckenii** (Kuhn) C.Chr., Index filicum: 8, 305 (1905); Schelpe: 215 (1970); Jacobsen: 425 (1983); Burrows: 288 (1990). *Acrostichum deckenii* Kuhn: 16, 17 (1868). Type: In Kilema ad radices montis Kilimandjaro (regionis Dschagga) 3–4 000 ped., 1864, v. d. *Decken & Kersten* 5 (B 51643!, holo.).

*Elaphoglossum tanganyicense* Krajina ex Pic.Serm.: 239–241, fig. 5, 6 (1968a). Type: Deutsch Ost Afrika (Tanganjika Terr.), Bezirk Morogoro: Ulugurugebirge. NW ca. 1 480 m Nebelwald, Farn vereinzelt am Bäumen u. Felsen Kiluguru: Lussangasanga, 10/12/1932, *Schlieben* 3071 (B 72090!, holo.; BM, G, P, S, iso).

**ILLUSTRATION:** Pichi Sermolli: t. 4, fig. A–E (1968b).

Epilithic or epiphytic, in moist evergreen forests, 1 850 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Rwanda, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

2. **Elaphoglossum kuhnii** Hieron. in Botanische Jahrbücher für Systematik 46: 399, 400 (1911); Schelpe: 215 (1970); Jacobsen: 424 (1983); Burrows: 288 (1990). Type: Trees – mountains, Sierra Leone. NE (Niger Expedition) 5.57, *Barter s.n.* (B 70946!, BM, K!, P, syn.); Kamerun: Urwald bei Station Lolodorf, 600 m, Dec. 1901, *Zenker* 2479 [B 70944!, lecto., designated by Pichi Sermolli (1975); K!, isolecto.; Kamerun, Aedf Bacdemmm bei Moliwe, 08/1905, *Schlechter* 15790 (B 70945!, syn.)].

**ILLUSTRATION:** Burrows: t. 68, fig. 292, 292a (1990).

Epilithic or epiphytic, in wet evergreen forests and riverine forests, deeply shaded, 1 200–2 000 m.

**DISTRIBUTION:** Bioko, Cameroon, Liberia, Malawi, Sierra Leone and Zimbabwe. Also in Madagascar.

3. **Elaphoglossum welwitschii** (Baker) C.Chr., Index filicum: 318 (1905); Schelpe: 216 (1970); Schelpe: 165 (1977). *Acrostichum welwitschii* Baker: 521, 522 (1874a). Type: Angola, Dist. Huila, 3 800–5 500 p. alt., ad praerupta madida pr. Cataractus agri Lopollensis, Maio 1860, *Welwitsch* 187 (K!, holo.).

**ILLUSTRATION:** Schelpe & Anthony: t. 29, fig. 1, 2 (1977).

Epilithic, along streams and at waterfalls in montane regions, shaded, 1 200–1 800 m.

**DISTRIBUTION:** Angola, Malawi, Tanzania and Zimbabwe.

2. Subsection **Musciosa** Mickel & Atehortúa in American Fern Journal 70: 62 (1980). Type: *Elaphoglossum muscosum* (Sw.) T.Moore; *Acrostichum muscosum* Sw.

## KEY TO THE SPECIES:

- Lamina paleae concolorous, narrowly linear ..... 1. **E. drakensbergense**  
 Lamina paleae discolorous, centrally dark with a broad hyaline margin, ovate to broadly ovate ..... 2. **E. randii**

1. **Elaphoglossum drakensbergense** Schelpe in Journal of South African Botany 34: 237, t. 2 (1968); Roux: 517 (1982b); Jacobsen: 426 (1983); Schelpe & Anthony: 233 (1986); Burrows: 290 (1990). Type: Natal, Bergville, Drakensberg, Injasuti area, weathered rock facing overhang by rock, S-aspect, 6 500–7 500 ft, 07/1956, *Esterhuysen 26052* (BOL!, holo.; B, BM!, CI, GH, K!, M, MO, P, PR, PRE, S, iso.).

ILLUSTRATION: Roux: t. 2 (1982b).

Terrestrial or epilithic, among grass tussocks and in rock crevices in montane grassland and along streams, exposed or lightly shaded, 1 800–2 900 m.

DISTRIBUTION: Lesotho? and South Africa.

2. **Elaphoglossum randii** Alston & Schelpe in Journal of South African Botany 23: 108, fig. 1b, c (1957). Type: Marion Island, Stony Ridge, 02/04/1954, *R.W. Rand 3710* (BM!, holo.; BM!, iso.), *Rand 3514, 3515, 3691* (BOL!, para.).

ILLUSTRATION: Alston & Schelpe: fig. 1b, c (1957).

Terrestrial or epilithic, in wet rock crevices and at the base of boulders, exposed or partially shaded, 20–100 m.

DISTRIBUTION: Marion and Prince Eduard Islands, endemic.

3. Subsection **Pilosa** Christ, Monographie des genus *Elaphoglossum*: 23 (1899). Lectotype: *Elaphoglossum pilosum* (Humb. & Bonpl. ex Willd.) T.Moore; *Acrostichum pilosum* Humb. & Bonpl. ex Willd., designated by Mickel & Atehortúa (1980).

**Elaphoglossum salicifolium** (Willd. ex Kaulf.) Alston, Catalogue of the vascular plants of São Tomé: 92 (1944). *Acrostichum salicifolium* Willd. ex Kaulf.: 58, 59 (1824). *Elaphoglossum viscosum* Schott var. *salicifolium* (Willd. ex Kaulf.) Hieron.: 35 (1910). *Elaphoglossum petiolatum* (Sw.) Urb. var. *salicifolium* (Willd. ex Kaulf.) C.Christ: 168 (1932b). *Elaphoglossum petiolatum* (Sw.) Urb. subsp. *salicifolium* (Willd. ex Kaulf.) Schelpe: 34 (1969b); Schelpe: 215 (1970); Schelpe & Diniz: 231 (1979); Jacobsen: 423 (1988); Burrows: 286 (1990). Type: Habitat in insula Bourboniae, *Desfontaine s.n.* (B-W 19509, holo.).

ILLUSTRATION: Tardieu-Blot: t. 48, fig. 7–9 (1964a).

Epilithic or epiphytic, deeply shaded in moist evergreen forests, 950–1 600 m.

DISTRIBUTION: Bioko, Cameroon, Democratic Republic of the Congo, Ghana, Guinea, Liberia, Malawi, Mozambique, Rwanda, São Tomé, Sierra Leone, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region.

4. Section **Polytrichia** Christ, Monographie des genus *Elaphoglossum*: 22 (1899). Lectotype: *Elaphoglossum crinitum* (L.) Christ; *Acrostichum crinitum* L., designated by Mickel & Atehortúa (1980).

Subsection **Hybrida** Christ, Monographie des genus *Elaphoglossum*: 23 (1899). Type: *Elaphoglossum hybridum* (Bory) T.Moore; *Acrostichum hybridum* Bory.

**Elaphoglossum hybridum** (Bory) Brack., United States Exploring Expedition, Filices 16: 69 (1854); Sim: 288 (1915); Schelpe: 213 (1970); Schelpe & Diniz: 228 (1979); Roux: 523 (1982b); Jacobsen: 420 (1983); Schelpe & Anthony: 231 (1986); Burrows: 291 (1990). *Acrostichum hybridum* Bory: 95 (1804); Sim: 222 (1892). *Olfersia hybrida* (Bory) C.Presl: 235 (1836). Type: Bourbon, Caverne Le Gentil, 1847, *M. Bory de St. Vincent s.n.* (P!, holo.).

ILLUSTRATION: Burrows: fig. 297, 297a, b (1990).

Epilithic or epiphytic, in deeply shaded moist evergreen forests, 1 300–3 000 m.

DISTRIBUTION: Bioko, Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, South Africa, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region and Tristan da Cunha.

5. Section **Setosa** (Christ) Mickel & Atehortúa in American Fern Journal 70: 64 (1980). *Elaphoglossum* Schott ex J.Sm. subsect. *Setosa* Christ: 23 (1899). Type: *Elaphoglossum villosum* (Sw.) J.Sm.; *Acrostichum villosum* Sw.

Subsection **Pilosella** Christ, Monographie des genus *Elaphoglossum*: 23 (1899). Type: *Elaphoglossum piloselloides* (C.Presl) T.Moore; *Acrostichum piloselloides* C.Presl.

## KEY TO THE SPECIES:

- 1a Sterile lamina spatulate or oblanceolate, rounded, less than 50 mm long ..... 3. **E. spatulatum**  
 1b Sterile lamina oblong or elliptic, acute or cordate, more than 50 mm long:  
     2a Sterile lamina apex caudate ..... 2. **E. mildbraedii**  
     2b Sterile lamina apex acute or obtuse ..... 1. **E. chevalieri**

1. **Elaphoglossum chevalieri** Christ in Journal de Botanique, Sér. 2, 2: 23 (1909b); Schelpe: 214 (1970); Schelpe & Diniz: 230 (1979); Jacobsen: 423 (1983); Burrows: 282 (1990). Type: São Tomé, Monte Café, *Chevalier 14292* (P, holo.).

**ILLUSTRATION:** Burrows: fig. 298, 298a, b (1990).

Epilithic, in deeply shaded moist evergreen forests, 1 200–1 850 m.

**DISTRIBUTION:** Cote d'Ivoire, Guinea, Liberia, Malawi, Mozambique, Príncipe, São Tomé, Sierra Leone and Zimbabwe.

2. **Elaphoglossum mildbraedii** Hieron., Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika-Expedition 1907–1908, Botanik 2: 34 (1910); Schelpe: 214 (1970). Type: Ruwenzori-West, Butagu-Tal, an einer niedrigen trockenen Felswand im Baumbuschwald der Vorberge, 1 800–2 000 m, 02/1908, *Mildbraed 2710* (B 51638!, holo.; B 51639!, iso.).

Epilithic, in deeply shaded moist evergreen forests, 2 010 m.

**DISTRIBUTION:** Kenya, Malawi and Tanzania.

3. **Elaphoglossum spathulatum** (Bory) T.Moore, Index filicum: 14 (1857); Sim: 291 (1915); Schelpe: 213 (1970); Schelpe & Diniz: 229 (1979); Roux: 513 (1982b); Jacobsen: 422 (1983); Schelpe & Anthony: 233 (1986); Burrows: 289 (1990). *Acrostichum spathulatum* Bory: 363 (1804); Sim: 224 (1892). *Olfersia spathulata* (Bory) C.Presl: 233 (1836). Type: Bourbon, R. St Denis, 1847, *Bory de St. Vincent s.n.* (Pl, holo.).

**ILLUSTRATION:** Burrows: t. 294a–e (1990).

Epilithic, mostly on moist moss-covered rocks along streams in moist evergreen forests, deeply shaded, 950–2 400 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, South Africa, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region and tropical America.

31. **BLECHNACEAE** (C.Presl) Copel., Genera filicum: 155 (1947). *Filicaceae* L. tribus *Aspleniaceae* sect. *Blechnaceae* C.Presl: 97 (1836). Type: *Blechnum* L.

Plants terrestrial, epilithic or epiphytic. *Rhizome* dictyostelic, widely creeping and often stoloniferous or suberect to erect and trunk-like; root cortex parenchymatous throughout or the outer cortex parenchymatous and the inner sclerenchymatous. *Fronds* approximate or widely spaced, dimorphic; stipe and rachis adaxially sulcate, not open to the sulci of the costae; lamina pinnately compound, fertile strongly contracted; hypostomatic, stomata mostly of the anomo- and polycytic types; aerophores in continuous dorsolateral lines along the stipe and rachis; venation free, simple or forked or anastomosing without included veinlets, always ending near the margin, catadromous towards the apex. *Indumentum* composed of paleae usually with short and or long marginal outgrowths generally ending in a large thin-walled cell, and unicellular, capitate glandular hairs occurring on the rhizome, the axes and the lamina surfaces. *Sori* short and discontinuous or long and continuous, along a vascular commissure flanking the costa; sporangia mostly long-stalked, simple, 3-seriate below the capsule; capsule globose to ellipsoidal, with 13–25 indurated annulus cells and a well defined stomium; indusium linear, continuous or discontinuous, mostly entire, opening towards the costa, or exindusiate. *Spores* ellipsoidal, monolete, with elaborate wings or tuberculate, 36–44 µm long. *Gametophyte*: spore germination of the *Vittaria*-type; germ filament terminating in a hair; prothallial development of the *Aspidium*-type; mature thallus cordate, often much elongated, midrib thick, wings undulating and lifted, rhizoids profuse, with secretory hairs superficially and marginally; antheridia oblong, the basal cell disk-shaped or elongated, dehiscing by the collapse of the large cap cell; archegonium neck with 4–5 tiers of cells, curved towards the posterior. Chromosome number based on  $2n = 56, 58, 64, 116, 124$  or  $148$ ; apogamy reported.

The affinity of the Blechnaceae to any other group of extant ferns remains unresolved. Holttum (1947), however, supports an affinity with the Aspleniaceae.

**KEY TO THE SUBFAMILIES:**

Sori indusiate; fertile fronds 1-pinnate ..... 1. subfam. **Blechnoideae**  
Sori exindusiate; fertile fronds mostly 2-pinnate ..... 2. subfam. **Stenochlaenoideae**

1. Subfamily **Blechnoideae**

**KEY TO THE GENERA:**

Veins frequently anastomose in the sterile lamina to form one or more series of areoles ..... 0199900 **Doodia**  
Veins always free in the sterile lamina ..... 0200000 **Blechnum**

**0199900 DOODIA** R.Br., Prodrumus florae Novae-Hollandiae et insulae Van-Diemen: 151 (1810). Lectotype: *Doodia aspera* R.Br., designated by J. Smith (1875).

Plants terrestrial. *Rhizome* dictyostelic, short, suberect, with short stoloniferous branches. *Fronds* approximate, caespitose, dimorphic, the fertile overtop the sterile; lamina pinnately compound, the basal pinnae short-stalked, broadly attached distally; hypostomatic, stomata of the polycytic type; venation free, simple or forked or anastomosing, forming one or two series of areoles, without included veinlets, ending near the margin. *Indumentum* composed of simple paleae, or with short, strongly deflexed marginal hairs ending in a large thin-walled cell, occurring on the rhizome and at the stipe base. *Sori* linear, medial, along an interrupted vascular commissure; sporangium stalk simple, 3-seriate throughout its entire length; capsule ellipsoidal, with 13–16 indurated annulus cells and a well defined stomium; indusium linear, entire, opening towards the costa. *Spores* ellipsoidal, monolete, rugose, 38–44 µm long. *Gametophyte*: mature thallus cordate, often much elongated, midrib thick, wings undulating and lifted, rhizoids profuse, with secretory hairs superficially and marginally; antheridia oblong, the basal cell disk-shaped or elongated, dehiscing by the collapse of the large cap cell; archegonium neck with 4–5 tiers of cells, curved

towards the posterior. Chromosome number based on  $2n = 64$ ; apogamy reported.

A genus of approximately 12 species centred in New Zealand, Australia and the Pacific islands.

\***Doodia squarrosa** Colenso in Transactions and Proceedings of the New Zealand Institute 13: 382 (1881); Parris: 601 (1972). *Doodia caudata* (Cav.) R.Br. var. *squarrosa* (Col.) C. Chr.: 243 (1905). Type: *sine loc. com.* W. Colenso 9/83, frond second from the right [K, lecto., designated by Parris (1972)].

**ILLUSTRATION:** Fig. 12M & N.

Terrestrial, on seasonally moist earthbanks and forest margins, exposed or deeply shaded, 300–500 m.

**DISTRIBUTION:** South Africa, naturalized in KwaZulu-Natal. A native of New Zealand and eastern Australia.

**0200000 BLECHNUM** L., Species plantarum 2: 1077 (1753). Lectotype: *Blechnum occidentale* L. as '*B. orientale*', designated by J. Smith (1875).

*Struthiopteris* Scop.: 168 (1760). Type: *Struthiopteris spicant* (L.) Scop.; *Osmunda spicant* L. (now *Blechnum spicant* (L.) Roth).

*Lomaria* Willd.: 160 (1809). Type: *Lomaria nuda* (Labill.) Willd.; *Onoclea nuda* Labill. (now *Blechnum nudum* (Labill.) Lueres.).

*Mesothema* C.Presl: 111 (1851). Type: *Mesothema australe* (L.) C.Presl; *Blechnum australe* L.; *Blechnum* L. sect. *Mesothema* (C.Presl) J.Sm.: 301 (1875).

*Lomaria* Willd. sect. *Loxochlena* J.Sm.: 304 (1875). Type: *Lomaria punctulata* (Sw.) J.Sm.; *Blechnum punctulatum* Sw.

Plants terrestrial, epilithic or epiphytic. *Rhizome* dictyostelic, short, decumbent and often stoloniferous or suberect to erect and trunk-like. *Fronds* approximate, mostly caespitose, strongly dimorphic, the fertile overtop the sterile; stipe and rachis adaxially sulcate, not open to the sulci of the costae; lamina 1-pinnatifid to 1-pinnate, the fertile much contracted; hypostomatic, stomata mostly of the polocytic type; aerophores in continuous dorsolateral lines along the stipe and rachis; venation free in sterile fronds, simple or forked, ending near the margin. *Indumentum* composed of narrow paleae that may be entire or variously set with marginal outgrowths often ending in a large thin-walled cell, simple and branched hairs and unicellular capitate glandular hairs occurring on the rhizome, axes and lamina surfaces. *Sori* linear, continuous or discontinuous along a vascular commissure flanking the costa; sporangium long-stalked, simple, 3-seriate below the capsule; capsule globose with 13–25 indurated annulus cells and a well defined stomium; indusium continuous or discontinuous, entire, opening towards the costa. *Spores* ellipsoidal, monolete, with elaborate wings, 36–44  $\mu\text{m}$  long. *Gametophyte*: mature thallus cordate, often much elongated, midrib thick, wings undulated and lifted, rhizoids restricted to the midrib, profusely set with superficial and marginal hairs, secretory, unicellular; antheridium oblong, the basal cell disk-shaped or elongated, dehiscing by a pore in the cap cell; archegonium neck with 4–5 tiers of cells, curving towards the posterior; apogamy reported. Chromosome number based on  $2n = 58, 60, 116, 124$  or 148.

A genus of approximately 200 species with a subcosmopolitan distribution, but with a better representation in the southern temperate areas than the northern temperate regions.

#### KEY TO THE SPECIES:

- 1a Sterile pinnae with at least the lower ones petiolate:
  - 2a Sterile pinna margins serrate ..... 3. **B. capense**
  - 2b Sterile pinna margins entire or shallowly undulate:
    - 3a Sterile pinna apex mucronate ..... 2. **B. australe**
    - 3b Sterile pinna apex attenuate ..... 7. **B. punctulatum**
- 1b Sterile pinnae all sessile, broadly attached to the rachis:
  - 4a Fronds coriaceous; basal pinnae not or slightly reduced ..... 8. **B. tabulare**
  - 4b Fronds membranous to firmly herbaceous; basal pinnae reduced:
    - 5a Sterile pinna apices obtuse to acute:
      - 6a Rhizome up to 3 mm in diameter ..... 6. **B. penna-marina**
      - 6b Rhizome up to 10 mm in diameter ..... 4. **B. inflexum**
    - 5b Sterile pinna apices attenuate to acute-acuminate:
      - 7a Sterile pinna margins entire ..... 1. **B. attenuatum**
      - 7b Sterile pinna margins minutely serrate ..... 5. **B. ivohibense**

1. **Blechnum attenuatum** (Sw.) Mett., Filices horti botanici lipsiensis: 64, t. 3, fig. 1–6 (1856); Schelpe: 235 (1970); Schelpe & Diniz: 248 (1979); Burrows: 326 (1990). *Onoclea attenuata* Sw.: 73 (1801). *Lomaria attenuata* (Sw.) Willd.: 290 (1810). *Spicanta attenuata* (Sw.) Kuntze: 821 (1891). Type: Ex insula Mauriti, Gröndal s.n. (SI, holo.).

*Blechnum giganteum* (Kaulf.) Schldtl.: 36 (1827); Jacobsen: 460 (1983); Schelpe & Anthony: 269 (1986). *Lomaria gigantea* Kaulf.: 150, 151 (1824). *Blechnum attenuatum* (Sw.) Mett. var. *giganteum* (Kaulf.) Bonap.: 43 (1914); Schelpe: 236 (1970); Burrows: 328 (1990). Type: Prom. bon. spei: Ad montem tabularem, versus Kerstenbosch, 02/1815–17, K.H. Bergius s.n. (B, holo.; HAL 81850, ?iso.).

*Lomaria heterophylla* Desv.: 330 (1811). *Blechnum heterophylla* (Desv.) Schldtl.: 37 (1827). Type: Habitat ad C. B. Spei, Sonnerat s.n. (P-JU 1278, holo.).

*Lomaria hamata* Kaulf.: 150 (1824). Type: Habitat in Promontorio bonae spei, *sine coll.* s.n. (not located).

*Lomaria punctata* Blume: 201 (1828). Type: (missing).

*Lomaria decipiens* Pappe & Raws.: 29 (1858). Type: Near Grahamstown, Atherstone s.n. [K, lecto., designated by Schelpe & Anthony (1986)].

ILLUSTRATIONS: Fig. 12R–T; Schelpe & Anthony: t. 91, fig. 1, 1a (1986).

Terrestrial, epilithic or epiphytic, in moist to wet forests and ravines, deeply shaded, 150–1 800 m.

DISTRIBUTION: Bioko, Burundi, Cameroon, Kenya, Malawi, Mozambique, Rwanda, São Tomé, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region.

2. *Blechnum australe* L., Mantissa plantarum: 130 (1767a); Sim: 125 (1892); Sim: 188 (1915); Launert: 8.1 (1969); Schelpe: 240 (1970); Schelpe & Anthony: 273 (1986); Burrows: 335 (1990). *Lomaria australis* (L.) Link: 75 (1841). *Mesothema australe* (L.) C.Presl: 111 (1851). *Blechnopsis australis* (L.) Trevis.: 166 (1851). *Struthiopteris australis* (L.) Trevis.: 572 (1869). *Spicanta australis* (L.) Kuntze: 821 (1891). Type: Habitat ad Cap b. spei, *sine coll. s.n.* (LINN 1247.3!, holo.).

*Lomaria pumila* Kaulf.: 151, 152 (1824). Type: Prom. bon. spei, 03/07/1829–38, *Ecklon et Zeyher s.n.* (HAL 76913, ?holo.).

*Blechnum australe* L. var. *aberrans* N.C. Anthony & Schelpe: 555 (1985); Schelpe & Anthony: 273 (1986); Burrows: 335 (1990). Type: Amabele, *Hardcastle* 297 (NBG!, holo.).

subsp. **australe**

ILLUSTRATIONS: Fig. 12O–Q; Schelpe & Anthony: t. 94, fig. 1 (1986).

Terrestrial or epilithic, in rock crevices on cliffs, at boulder bases and on moist forest floors, exposed to moderately shaded, 150–2 000 m.

DISTRIBUTION: Kenya, Lesotho, Malawi, Namibia, South Africa, Swaziland, Tanzania and Zimbabwe. Also on the South Atlantic islands.

subsp. **auriculatum** (Cav.) de la Sota is confined to southern Brazil, Uruguay and Argentina.

3. *Blechnum capense* *Burm.f.*, Flora indica, Prodromus: 28 (1768); Sim: 186 (1915); Schelpe: 239 (1970); Schelpe & Diniz: 250 (1979); Schelpe & Anthony: 269 (1986); Burrows: 331 (1990). Type: Cape, *sine coll. s.n.* [G!, lecto., designated by Roux (1982a)].

*Osmunda capensis* L.: 306 (1771b). *Onoclea capensis* (L.) Sw.: 111 (1806). *Lomaria capensis* (L.) Willd.: 291 (1810). *Blechnum capense* (L.) Schltdl.: 34 (1827). *Spicanta capensis* (L.) Kuntze: 821 (1891). Type: Habitat inter montes Cap. b. Spei, inter montem tabularem et Diaboli, ad rivulum, *Koenig* 22 (LINN 1244.11!, holo.).

*Blechnum sylvaticum* Schelpe: 221 (1979), nom. nov. for *B. capense* (L.) Schltdl.; Jacobsen: 464 (1983). Type: As for *Osmunda capensis* L.

*Lomaria procera* sensu Sim: 122 (1892).

ILLUSTRATION: Schelpe & Anthony: t. 92, fig. 1, 1a (1986).

Terrestrial, in marshy ground and on perennial streambanks, exposed or moderately shaded, 150–2 250 m.

DISTRIBUTION: Malawi, Mozambique, South Africa, Swaziland and Zimbabwe.

4. *Blechnum inflexum* (Kunze) Kuhn, Filices africanæ: 92 (1868); Sim: 178 (1915); Schelpe: 237 (1970); Jacobsen: 461 (1983); Schelpe & Anthony: 267 (1986); Burrows: 328 (1990). *Lomaria inflexa* Kunze: 150 (1844a); Sim: 116 (1892). *Struthiopteris inflexa* (Kunze) Ching: 243 (1940a). Type: Vorgebirge der guten Hoffnung ... ohne Angabe des Standorts eingesandt, *Gueinzus s.n.* (LZ†); Cape Province, Ceres, Hansiesberg, *Esterhuysen* 25747 [BOL!, neo., designated by Schelpe & Anthony (1986); B, C, K, M, MO, P, PR, PRE, S, isoneo.].

*Lomaria discolor* Willd. var. *natalensis* Baker: 481 (1874a). Type: Natal, *McKen & Buchanan s.n.* (K, holo.).

ILLUSTRATION: Schelpe & Anthony: t. 93, fig. 2, 2a (1986).

Terrestrial, at boulder bases in grassland and on wet streambanks and forest margins in montane regions, exposed or moderately shaded, 200–1 600 m.

DISTRIBUTION: South Africa and Zimbabwe.

5. *Blechnum ivohibense* C.Chr. in Archives de Botanique, Bulletin Mensuel 2: 211 (1928); Schelpe & Diniz: 249 (1979); Jacobsen: 462 (1983); Burrows: 330 (1990). Type: Madagascar. Pic d'Ivohibe (Bara). Restes de forêts, alt. 1 500–2 000 m, 05–11/11/1924, *H. Humbert* 3300 (BM, holo.).

ILLUSTRATION: Schelpe: t. 68, fig. A, B (1970).

Terrestrial, on deeply shaded streambanks in wet evergreen forests, 1 400–1 850 m.

DISTRIBUTION: Kenya, Malawi, Mozambique, Tanzania and Zimbabwe. Also in the Madagascan region.

6. *Blechnum penna-marina* (Poir.) Kuhn, Filices africanæ: 92 (1868). *Polypodium penna-marina* Poir.: 520 (1804). *Lomaria penna-marina* (Poir.) Trevis.: 570 (1869). *Struthiopteris penna-marina* (Poir.) Maxon & Morton: 44 (1939). Type: Straits of Magellan, *Commerson s.n.* (P-Desf., holo.; BM, Fl, iso.).

*Lomaria antarctica* Carmich.: 513 (1818). Type: Tristan d'Acunha, *Carmichael s.n.* (BM, holo.; K, iso.).



Chambers & Farrant (1996) recognize four subspecies.

Terrestrial, among low scrub, at boulder bases and in rock crevices, wet conditions, exposed or partially shaded, 20–100 m.

**DISTRIBUTION:** Marion and Prince Eduard Islands, circum-Antarctic.

7. **Blechnum punctulatum** Sw. in *Journal für die Botanik* 1800, 2: 74, 75 (1801); Sim: 181 (1915); Schelpe: 239 (1970); Jacobsen: 466 (1983); Schelpe & Anthony: 273 (1986). *Lomaria punctulata* (Sw.) Kunze: 507 (1836); Sim: 118 (1892). *Mesothema punctulata* (Sw.) C.Presl: 113 (1851). *Blechnopteris punctulata* (Sw.) Trevis.: 166 (1851). *Struthiopteris punctulata* (Sw.) Trevis.: 373 (1869). *Spicanta punctulata* (Sw.) Kuntze: 822 (1891). Type: ex Cap. b. Spei, *Thunberg s.n.* Herb. Swartz (S!, holo.).

*Blechnum rigidum* Sw.: 75 (1801). *Mesothema rigidum* (Sw.) C.Presl: 113 (1851). *Lomaria rigida* (Sw.) Fée: 68 (1852b). *Struthiopteris rigida* (Sw.) Trevis.: 572 (1869). Type: ex Cap. Bon. Spei, *Thunberg s.n.* Herb. Swartz (S, holo.).

*Lomaria auriculata* Desv.: 330 (1811). Type: Habitat ad C. B. Spei, *Descrez s.n.* (P-JU 1370, holo.).

*Lomaria densa* Kaulf.: 151 (1824). Type: Habitat in Promontorio bonae spei, *Sieber s.n.* (HBG, holo.).

*Lomaria dregeana* Fée: 9 (1865). *Struthiopteris dregeana* (Fée) Trevis.: 572 (1869). Type: Cape, *Drège s.n.* (missing).

#### KEY TO THE VARIETIES:

1a Fertile lamina reduced; sori parallel to the costa:

2a Sori confluent ..... 1. var. **punctulatum**

2b Sori on the lower pinnae breaking up towards the rachis into small separate oval sori ..... 2. var. **atherstonii**

1b Fertile lamina not conspicuously reduced; sori set at an angle to the costa:

3a Sori separate, oval ..... 4. var. **krebsii**

3b Sori confluent in saw-tooth line, together with detached sori ..... 3. var. **intermedia**

7.1. var. **punctulatum**, Burrows: 334 (1990).

**ILLUSTRATION:** Schelpe & Anthony: t. 95, fig. 1, 1a (1986).

Terrestrial or epilithic, on moist forest floors and boulders in evergreen forests, shaded, 50–1 700 m.

**DISTRIBUTION:** Lesotho, Malawi, South Africa, Swaziland, Tanzania and Zimbabwe. Also in the Madagascan region.

7.2. var. **atherstonii** (Pappe & Raws.) Sim, *Ferns of South Africa*: 183, t. 79 (1915); Jacobsen: 467 (1983); Schelpe & Anthony: 275 (1986); Burrows: 334 (1990). *Blechnum atherstonei* Pappe & Raws.: 16 (1858). *Lomaria punctulata* (Sw.) Kunze var. *atherstonei* (Pappe & Raws.) Sim: 120 (1892). Type: On the south-west of Graham's Town, near the blockhouse, 1856, *Atherstone s.n.* (not located).

**ILLUSTRATION:** Schelpe & Anthony: t. 2 (1986).

Terrestrial, on seasonally moist forest floors and forest margins, moderately to deeply shaded, 50–1 700 m.

**DISTRIBUTION:** Malawi, South Africa and Swaziland.

7.3. var. **intermedia** (Sim) Sim, *Ferns of South Africa*: 184, t. 80 (1915); Jacobsen: 468 (1983); Schelpe & Anthony: 277 (1986). *Lomaria punctulata* (Sw.) Kunze var. *intermedia* Sim: 121 (1892). Type: Cape, Grahamstown Kloofs. Sim in TRV 278 (PRE, syn.); Natal, Buchanan in TRV 305 (PRE, syn.).

Terrestrial, in seasonally moist forests and scrub, exposed or lightly shaded, 300–1 500 m.

**DISTRIBUTION:** South Africa.

7.4. var. **krebsii** (Kunze) Sim, *Ferns of South Africa*: 185, t. 81 (1915); Jacobsen: 468 (1983); Schelpe & Anthony: 277 (1986); Burrows: 334 (1990). *Onychium krebsii* Kunze: 504 (1836). *Scolopendrium krebsii* (Kunze) Kunze: 118 (1844b). *Lomaria punctulata* (Sw.) Kunze var. *krebsii* (Kunze) Sim: 122 (1892). Type: Cap. b. Sp., *Krebs s.n.* (B!, holo.).

**ILLUSTRATIONS:** Fig. 12U; Schelpe & Anthony: t. 94, fig. 3 (1986).

Terrestrial, in moist or seasonally moist forests, growing on streambanks, 200–1 300 m.

**DISTRIBUTION:** South Africa.

8. **Blechnum tabulare** (Thunb.) Kuhn, *Filices africae*: 94 (1868); Sim: 187 (1915); Schelpe: 184 (1977); Schelpe & Diniz: 250 (1979); Jacobsen: 463 (1983); Schelpe & Anthony: 271 (1986); Burrows: 331 (1990). *Pteris tabularis* Thunb.: 171 (1800). *Lomaria tabularis* (Thunb.) Mett. ex Baker: 418 (1870). Type: e Cap b. Spei, in lateribus (aquo)sis summi Taffelberg, *Thunberg s.n.* (UPS-THUNB 24965!, holo., S, iso.).

*Lomaria coriacea* Schrad.: 916 (1818). Type: Cape, *Hesse s.n.* (?LE, holo.).

*Lomaria gueinzii* Moug. ex Fée: 69 (1852b). Type: South Africa, *Gueinzii s.n.* Herb. Moug. (missing).

*Lomaria cycadioides* Pappe & Raws.: 28 (1858). *Blechnum cycadioides* (Pappe & Raws.) Kuhn: 91 (1868). Type: In the woods of Natal, *Plant* 335 (missing).

*Lomaria dalgairnsiae* Pappe & Raws.: 27 (1858). *Blechnum dalgairnsiae* (Pappe & Raws.) Kuhn: 92 (1868). Type: In the dense forests of Knysna, *Dalgairns s.n.* (BM, holo.).

*Lomaria boryana* sensu Sim: 123 (1892).

ILLUSTRATIONS: Fig. 12V; Schelpe & Anthony: t. 93, fig. 1, 1a (1986).

Terrestrial, in wet montane grasslands and scrub, mostly along streams but also on rocky outcrops, exposed or lightly shaded, 350–1 850 m.

**DISTRIBUTION:** Angola, Burundi, Cameroon, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, Nigeria, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

2. Subfamily **Stenochlaenoideae** (Ching) J.P.Roux, comb. et stat. nov. *Stenochlaenaceae* Ching: 18, 19 (1978b). Type: *Stenochlaena* J.Sm.

**0200400 STENOCHLAENA** J.Sm. in Journal of Botany (Hooker) 4: 149 (1841b). Lectotype: *Stenochlaena scandens* (Sw.) J.Sm., nom. illeg. *Onoclea scandens* Sw., nom. illeg. (now *Stenochlaena palustris* (Burm.f.) Bedd.; *Polypodium palustris* Burm.f.), designated by Pfeiffer (1874).

Plants terrestrial. *Rhizome* dictyostelic, widely creeping, branched. *Fronds* widely spaced, dimorphic; stipe and rachis adaxially sulcate, not open to the sulci of the costae; sterile lamina 1-pinnate, the fertile lamina strongly contracted, 1- or 2-pinnate; hypostomatic, stomata mostly of the polocytic type; venation free, simple or forked, ending near the margin, distinctly catadromous towards the apex. *Indumentum* composed of small, much branched paleae occurring on the axes and costa. *Sori* linear, confluent, along a vascular commissure near and parallel to the costa; sporangium stalk slender, simple, 3-seriate throughout most of its length; capsule ellipsoidal, with 14–17 indurated annulus cells and a well defined stomium; exindusiate. *Spores* ellipsoidal, monolet, tuberculate, 38–44 µm long. *Gametophyte*: mature thallus cordate, often much elongated, midrib thick, wings lifted, rhizoids confined to the midrib, often septate, profusely set with superficial and marginal hairs, unicellular, secretory; antheridium oblong, the basal cell disk-shaped or elongated, dehiscing by a pore in the cap cell; archegonium neck with 4–5 tiers of cells, curved towards the posterior. Chromosome number based on  $2n = 148$ .

A genus of approximately six species confined to the palaeotropics.

**Stenochlaena tenuifolia** (Desv.) T.Moore in Gardeners Chronicle 1856: 193 (1856); Sim: 192 (1915); Schelpe: 240 (1970); Schelpe & Diniz: 252 (1979); Jacobsen: 471 (1983); Schelpe & Anthony: 278 (1986); Burrows: 336 (1990). *Lomaria tenuifolia* Desv.: 326 (1811). *Lomariobotrys tenuifolia* (Desv.) Fée: 46 (1852b). *Polybotrya tenuifolia* (Desv.) Kuhn: 52 (1868). *Acrostichum tenuifolium* (Desv.) Baker: 412 (1868b); Sim: 224 (1892). *Lomariopsis tenuifolia* (Desv.) Christ: 42 (1897). Type: Habitat in Madagascar, ?Commerson s.n. (P, holo.).

*Lomaria meyeriana* Kunze: 509 (1836). *Stenochlaena meyeriana* (Kunze) C.Presl: 166 (1851). *Lomariobotrys meyeriana* (Kunze) Fée: 46 (1852b). *Polybotrya meyeriana* (Kunze) Mett.: 24 (1856). *Acrostichum meyerianum* (Kunze) Hook.: t. 16 (1862b), as '*meyeranum*'. Type: In palude sylvatica inter a Omtendo et Omsamculo, 70 m, Drège s.n. [B!], lecto., designated by Roux (1986); BM!, isolec.].

*Stenochlaena mildbraedii* Brause: 384 (1915); Schelpe: 185 (1977). Type: Fernando Po, Musola oberhalb San Carlos (Westküste), Kulturregion der Bubis, c. 500 m ü. M., November 1911, *Mildbraed* 6995 [B 121855, lecto., designated by Tardieu Blot (1953b) sensu Verdcourt (1992); Südkameruner Wald: Bez. Molundu am Dscha (Ngoko) 15°12' ö L., 2°N Br. Nginda 21 km nördlich Molundu, 01/1911, *Mildbraed* 4192 (B 121826, 121853, 121854, syn.); Südkameruner Waldgebiet: Bez. Ebolowa, zwischen Posten Sangmelima und Ebolowa, 1911, *Mildbraed* 5554 (B 121856–121859, syn.)].

ILLUSTRATION: Schelpe: t. 69, fig. 1 (1970).

Terrestrial, becoming epiphytic, in wet forests and swamp forest margins, exposed or lightly shaded, 20–700 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Kenya, Mozambique, Pemba, South Africa, Tanzania, Uganda, and Zanzibar and Zimbabwe. Also in Madagascar.

32. **ASPLENIACEAE** Mett. ex A.B.Frank, in J. Leunis, Synopsis der Pflanzenkunde, 2nd edn, 3: 1465 (1877). Type: *Asplenium* L.

Plants terrestrial, epilithic or epiphytic. *Rhizome* dictyostelic, creeping, suberect or erect, short or long, often stoloniferous; roots with an inner sclerenchymatous cortex with a thick inner wall and a thin outer wall, the outer cortex parenchymatous. *Fronds* monomorphic, approximate or widely spaced or caespitose; stipe and rachis terete or adaxially slightly flattened or shallowly sulcate, the sulcus not open to the sulci of the lower order axes, the stipe generally with two distinct vascular bundles uniting upwards into a single X-shaped bundle, rachis often elongate and proliferous; lamina simple to variously pinnately compound, often with a proliferous bud at or near the lamina apex, anadromous; hypostomatic, stomata mostly of the anomo- and copolocytic types; venation free, ending near the margin, forked or pinnately divided, anadromous. *Indumentum* composed of sessile or short-stalked clathrate paleae often bearing marginal indumentum occurring on the rhizome, axes and lamina surfaces, and unicellular capitate glands on the axes and lamina surfaces. *Sori* linear, elongated and dorsally along a vein or shortened and near marginal; sporangium long-stalked, simple, uniseriate, 3-seriate below the capsule; capsule globose, with 14–20 indurated annulus cells and a well defined stomium; indusium obsolete (in subgenus *Ceterach*) or indusium elongate, entire or with marginal indument, if submarginal, then the margins generally fused to the lamina forming a pouch. *Spores* ellipsoidal, monolet, generally with wing-like folds, 22–60 µm long. *Gametophyte*: spore germination of the *Vittaria*-type; germ filament terminating in a hair, prothallial development of the *Aspidium*-type; mature thallus cordate, the midrib thin or thick, the wings large, the margins smooth or with protrusions, with slender, papillate, non-secretory glands, often septate, often mamillate; antheridium first formed, restricted to the midrib, the basal cell barrel-shaped, dehiscing by a pore in the cap cell; archegonium neck slender, curving towards the posterior. Chromosome number based on  $2n = 72, 108, 144, 219, 288, 360$ ; apogamy reported.

The affinity of Aspleniaceae with any of the other families is not clear.

**0201400 ASPLENIUM** L., Species plantarum 2: 1078 (1753). Lectotype: *Asplenium marinum* L., designated by J. Smith (1875).

*Loxoscapha* T.Moore: 227 (1853). Lectotype: *Loxoscapha concinna* (Schrad.) T.Moore; *Davallia concinna* Schrad., now *Asplenium theciferum* (Humb., Bonpl. & Kunth) Mett. var. *concinnum* (Schrad.) Schelpe

*Caenopteris* P.J.Bergius: 249 (1786). Type: *Caenopteris rutifolia* P.J.Bergius; *Asplenium rutifolium* (P.J.Bergius) Kunze.

*Tarachia* C.Presl: 74 (1851). Type: *Tarachia furcata* (Thunb.) C.Presl; *Asplenium furcatum* Thunb. (now *Asplenium aethiopicum* (Burm.f.) Bech.

*Ceterach* Willd.: 578 (1804b). Type: *Ceterach officinarum* Willd., nom. cons.

*Hymenasplenium* Hayata: 712 (1927). Type: *Hymenasplenium unilaterale* (Lam.) Hayata; *Asplenium unilaterale* Lam.; *Asplenium* L. sect. *Hymenasplenium* (Hayata) K.Iwats.: 44 (1975); *Asplenium* L. subgen. *Hymenasplenium* (Hayata) Bir: 220 (1998).

Generic description as for the family.

A genus of approximately 700 species with a cosmopolitan distribution. The genus is often subdivided into several genera and subgenera. Morton & Lellinger (1966) recognize *Loxoscapha* T.Moore and placed the species with veins and sori occurring at an acute angle to the costa, and with rachises more or less scaly and sometimes hairy in *Asplenium* section *Sphenopteris* Mett. The occurrence of intermediate forms between these genera and sections render most of these classifications unsatisfactory. The classification followed here is conservative in that only two subgenera, *Asplenium* and *Ceterach* are recognized. *Asplenium* section *Hymenasplenium* (Hayata) K.Iwats. is widely accepted as a well-defined group (Mitui et al. 1989; Murakami & Moran 1993). The section is defined by creeping rhizomes, dorsiventrally symmetrical steles, swollen stipe bases or trophopods, and chromosome numbers based on  $n = 38$  or 39. *Asplenium obscurum* Blume and *A. unilaterale* Lam. belong to this section.

#### KEY TO THE SUBGENERA:

Lamina abaxially usually densely set with paleae obscuring the sori; indusium obsolete..... 1. subgen. **Ceterach**  
Lamina abaxially sparsely set with small paleae; sori indusiate ..... 2. subgen. **Asplenium**

1. Subgenus **Ceterach** (Willd.) Vida ex Bir, Fraser-Jenk. & Lovis in Fern Gazette 13: 61 (1985).

A subgenus of five or six species confined to Africa, the Madagascan region, Macaronesia, St Helena, Europe and Britain.

**Asplenium cordatum** (Thunb.) Sw. Journal für die Botanik 1800, 2: 54 (1801). *Acrostichum cordatum* Thunb.: 171 (1800). *Ceterach cordatum* (Thunb.) Desv.: 223 (1827); Launert: 9.1 (1969); Schelpe: 188 (1970); Schelpe: 148 (1977); Jacobsen: 379 (1983); Schelpe & Anthony: 206 (1986); Burrows: 255 (1990). *Grammitis cordata* (Thunb.) Sw.: 23, 217 (1806). *Cincinalis cordata* (Thunb.) Desv.: 311 (1811). *Gymnogramma cordata* (Thunb.) Schldtl.: 16 (1825a); Sim: 210 (1892); Sim: 175 (1915). Type: e Cap bonae spei, Thunberg s.n. (UPS-THUNB 24439!, holo.).

*Ceterach crenata* Kaulf.: 85, 86 (1824), nom. illeg. Type: Habitat in Promontorio bonae spei, sine coll. s.n. (not located).

*Gymnogramma capensis* Spreng. ex Kaulf.: 183 (1831), nom. nud. *Ceterach cordatum* (Thunb.) Desv. var. *capense* (Spreng. ex Kaulf.) Kümmerle: 283 (1909). Type: Cap. Bon spei: In einer Felsritze am Löwenberg, 3. Höhe, Zeyher s.n., Fl. Cap. No. 273 (HAL 81877 ?holo.; BOLI, iso.).

*Ceterach capense* Kunze: 496 (1836), as 'capensis'. *Grammitis capensis* (Kunze) T.Moore: 232 (1861). *Asplenium capense* (Kunze) Bir, Fraser-Jenk. & Lovis: 61 (1985). Type: Port Natal et Afrique meridionale, Drège s.n. [G!, lecto., designated by Roux (1986); G!, isolecto.; Ceded territory, bergwaldungen an den Quellen des Katrivier, Oberhalb Philipstown, alt. 3 000–4 000 ped., Ecklon & Zeyher s.n. (UPS!, paralecto.)].

*Gymnogramma cordata* (Thunb.) Schldtl. var. *subbipinnata* Hook.: t. 7 (1861). Type: Macalisberg, Ecklon & Burke s.n. (missing).

*Gymnogramma namaquensis* Pappe & Raws.: 42 (1858). *Gymnogramma cordata* (Thunb.) Schldtl. var. *namaquensis* (Pappe & Raws.) Sim: 212 (1892). *Ceterach cordatum* (Thunb.) Desv. var. *namaquensis* (Pappe & Raws.) Sim: 176 (1915). Type: Between rocks near Modderfontein, Namaqualand, 1856, Whitehead s.n. (missing).

*Gymnogramma cordata* (Thunb.) Schldtl. var. *bipinnata* Sim: 212 (1892). *Notholaena bipinnata* (Sim) Sim: 224 (1915), excl. Eyles & Johnson 1021 (GRA). Type: Namaqualand, Holland s.n. [NBG!, lecto., designated by Schelpe & Anthony (1986)].

*Ceterach cordatum* (Thunb.) Desv. var. *pinnatifida* Sim: 177 (1915). Type: Boschberg, Somerset East, Schlechter 2703 [GRA, lecto., designated by Schelpe & Anthony (1986); BM, isolecto.].

Chromosome number:  $2n = 72$ , c. 144 (Bir, Fraser-Jenkins & Lovis 1985).

**ILLUSTRATION:** Fig. 16R & S.

Terrestrial or epilithic, in moist or seasonally moist rock crevices on rock outcrops and cliffs, rarely in forests, poikilohydrous, exposed or lightly shaded, 50–2 900 m.

**DISTRIBUTION:** Angola, Botswana, Kenya, Lesotho, Namibia, South Africa, Tanzania and Zimbabwe. Also in the Madagascan region.

2. Subgenus **Asplenium**

#### KEY TO THE SPECIES:

- 1a Fronds simple:  
2a Lamina linear-lanceolate, caudate; veins mostly 2-forked ..... 55. **A. subintegrum**  
2b Lamina lanceolate to linear-lanceolate, cuneate to narrowly cuneate but never caudate; veins mostly 1-forked:  
3a Paleae cells thin-walled; fronds to 40 mm broad ..... 15. **A. currorii**

- 3b Paleae cells thick-walled; fronds up to 80 mm broad:
- 4a Rhizome paleae entire ..... 3. **A. africanum**
- 4b Rhizome paleae irregularly set with marginal outgrowths ..... 25. **A. holstii**
- 1b Fronds 1-pinnate to 3-pinnate-pinnatifid:
- 5a Plants stoloniferous:
- 6a Pinnae oblong to rhombic or deltate, dentate ..... 54. **A. stoloniferum**
- 6b Pinnae with linear terminal lobes, mostly obliquely spatulate-obtuse ..... 33. **A. mannii**
- 5b Plants not stoloniferous:
- 7a Fronds 1-pinnate to 1-pinnate-pinnatifid:
- 8a Fronds proliferous near the apex:
- 9a Proliferation bud at the end of an elongated rachis ..... 48. **A. sandersonii**
- 9b Proliferating bud on an unmodified rachis, at the apex, on or at the base of the apical segment:
- 10a Proliferating bud at the apex of the apical pinna:
- 11a Apex acuminate with a proliferating bud at the apex ..... 60. **A. variable** var. **paucijugum**
- 11b Apex emarginate with a proliferating bud in the sinus ..... 17. **A. emarginatum**
- 10b Proliferating bud on the rachis, adaxially on the apical segment or at the base of the apical segment:
- 12a Proliferating bud adaxially on the apical segment ..... 5. **A. angolense**
- 12b Proliferating bud at the base of the apical segment or on the rachis:
- 13a Proliferating bud at the base of the apical segment:
- 14a Rhizome short-decumbent, fronds spaced ..... 22. **A. gemmascens**
- 14b Rhizome short, erect; fronds caespitose:
- 15a Rachis winged ..... 9. **A. barteri**
- 15b Rachis not winged:
- 16a Pinnae ovate-lanceolate, the margins regularly shallowly crenate ..... 23. **A. gemmiferum**
- 16b Pinnae oblong-acuminate, the margins incised into 2- to 3-fid oblong to oblanceolate lobes ..... 19. **A. flexuosum**
- 13b Proliferating bud on the rachis:
- 17a Rachis abaxially pubescent ..... 44. **A. protensum**
- 17b Rachis not abaxially pubescent:
- 18a Pinnae incised more than  $\frac{1}{2}$ -way to the costa:
- 19a Apical segment of the lamina above the proliferating bud with less than 5 lobes ..... 16. **A. dregeanum**
- 19b Apical segment of the lamina above the proliferating bud with more than 5 lobes ..... 42. **A. preussii**
- 18b Pinnae entire, crenate or dentate:
- 20a Fronds dimorphic, the fertile longer than the sterile; pinna apices obtuse to acute:
- 21a Pinnae of the fertile fronds becoming smaller and more distant towards the apex ..... 14. **A. christii**
- 21b Pinnae of the fertile fronds not significantly smaller and more distant towards the apex ..... 36. **A. mossambicense**
- 20b Fronds monomorphic; pinna apices acuminate, attenuate or caudate:
- 22a Sori not borne on forked veins ..... 32. **A. lunulatum**
- 22b Sori borne on forked veins:
- 23a Pinna margin shallowly crenate to subentire; apical pinna similar in size and shape to the subapical pinna ..... 23. **A. gemmiferum**
- 23b Pinnae margins incised with each lobe 2-fid at least in the lower part of the pinna; apical pinna much longer than the subapical pinna ..... 11. **A. boltonii**
- 8b Fronds not proliferous near the apex:
- 24a Pinnae dimidiate:
- 25a Stipe and rachis castaneous ..... 59. **A. unilaterale**
- 25b Stipe and rachis matt, greyish-green ..... 39. **A. obscurum**
- 24b Pinnae not dimidiate:
- 26a Stipe and rachis castaneous to black; fronds caespitose:
- 27a Pinnae narrowly trapeziform in outline:
- 28a Pinnae longly caudate ..... 34. **A. megalura**
- 28b Pinnae acuminate, not caudate:
- 29a Pinnae up to 50 x 15 mm, elongate-trapeziform, deeply pinnatifid into oblong to narrowly oblong lobes, irregularly serrate ..... 13. **A. chaseanum**
- 29b Pinnae up to 80 x 25 mm, elongate-trapeziform, acroscopically auricled, crenulate-dentate ..... 24. **A. hemitomum**
- 27b Pinnae not narrowly trapeziform in outline or long-caudate:
- 30a Pinnae deeply incised acroscopically into simple or 2-fid lobes:
- 31a Lamina with up to 48 pinna pairs, the lower pinnae gradually reduced, up to 18 x 7 mm ..... 20. **A. formosum**
- 31b Lamina with up to 20 pinna pairs; the lower pinnae hardly reduced, up to 80 x 16 mm ..... 52. **A. smedsii**
- 30b Pinnae crenate or dentate:
- 32a Pinnae subcircular ..... 57. **A. trichomanes** subsp. **quadrivalens**
- 32b Pinnae oblong:

- 33a Pinnae with sori on the acroscopic and basiscopic side of the costa ..... 41. **A. platyneuron**  
 33b Pinnae with one or more sori confined to the basiscopic side of the costa:  
   34a Pinnae with only one (frequently two) sori on the basiscopic side of the costa ..... 35. **A. monanthes**  
   34b Pinnae with 3 or more sori on the basiscopic side of the costa ..... 38. **A. normale**  
 26b Rachis matt-green or greyish-green, or if almost castaneous then the rhizome creeping:  
   35a Rhizome creeping; fronds widely spaced; sori borne close to the costa ..... 21. **A. friesiorum**  
   35b Rhizome erect; fronds caespitose; sori borne at and angle to the costa:  
     36a Apical pinna resembling the middle pinnae:  
       37a Pinna margin irregularly undulate ..... 7. **A. atroviride**  
       37b Pinna margin regularly crenate or serrate:  
         38a Sori borne along the anterior vein branches; lamina mostly with more than 7 pinna pairs ..... 6. **A. anisophyllum**  
         38b Sori borne along the anterior and posterior vein branches; lamina with up to 7 pinna pairs ..... 43. **A. prionitis**  
     36b Apical pinnae gradually decrescent:  
       39a Venation of pinnae flabellate:  
         40a Lamina linear-lanceolate, 1-pinnate to 1-pinnate-pinnatifid; proximal pinna pairs gradually reduced to the base ..... 46. **A. ramlowii**  
         40b Lamina oblong-lanceolate or triangular; proximal pinna pairs equal in length or only slightly reduced towards the base:  
           41a Rhizome to 4 mm in diameter; stipe as long or shorter than the lamina ..... 49. **A. schelpei**  
           41b Rhizome to 2 mm in diameter; stipe always longer than the lamina ..... 4. **A. albersii**  
       39b Venation of pinnae pinnately branched:  
         42a Stipe and rachis with numerous black hair-like paleae ..... 40. **A. pellucidum** subsp. **pseudohorridum**  
         42b Stipe base with paleae similar to those of the rhizome but the rachis glabrous:  
           43a Lamina gradually tapering towards the base ..... 18. **A. erectum**  
           43a Lamina not or hardly decrescent at the base:  
             44a Stipe black abaxially; pinnae deeply incised towards the base ..... 8. **A. auritum**  
             44b Stipe matt-grey or green; pinnae serrate to crenate ..... 27. **A. inaequilaterale**  
     7b Fronds 2-pinnate to 4-pinnatifid:  
       45a Sori marginal, solitary on the ultimate segments of the frond:  
         46a Sori near apical on the ultimate segments ..... 56. **A. theciferum** var. **concinnum**  
         46b Sori lateral on the ultimate segments:  
           47a Sori about as long as broad ..... 26. **A. hypomelas**  
           47b Sori more than twice as long as broad:  
             48a Rachis and lamina abaxially with scattered narrowly lanceolate-cordate paleae with numerous long filiform marginal outgrowths at the base ..... 31. **A. loxoscapoides**  
             48b Rachis and lamina glabrous adaxially or if paleated then not as above ..... 47. **A. rutifolium**  
       45b Sori inframarginal, 2 or more on the ultimate segments:  
         49a Lamina, rachis and stipe thinly pubescent with white hairs ..... 45. **A. pumilum**  
         49b Lamina glabrous or set with small clathrate paleae:  
           50a Fronds proliferous near the apex ..... 10. **A. blastophorum**  
           50b Fronds not proliferous, or proliferating buds confined to the lamina base:  
             51a Lamina 3-pinnate-pinnatifid:  
               52a Rhizome erect; ultimate lobes acute ..... 30. **A. lobatum**  
               52b Rhizome creeping; ultimate lobes serrate:  
                 53a Ultimate segments linear ..... 28. **A. linckii**  
                 53b Ultimate segments cuneate ..... 2. **A. aethiopicum**  
             51b Lamina 2-pinnate to 3-pinnate:  
               54a Veins ending in a linear hydathode ..... 8. **A. auritum**  
               54b Veins not ending in a linear hydathode:  
                 55a Rhizome erect or short decumbent; fronds herbaceous; venation pinnately branched:  
                   56a Stipe bases green and abruptly swollen ..... 1. **A. adiantum-nigrum**  
                   56b Stipe bases not green and abruptly swollen ..... 61. **A. varians** subsp. **fimbriatum**  
                 55b Rhizome creeping or short-decumbent; fronds thinly coriaceous; venation flabellate:  
                   57a Frond caespitose:  
                     58a Rhizome paleae 1–3 mm long ..... 29. **A. lividum**  
                     58b Rhizome paleae 6–8 mm long:  
                       59a Lamina 2-pinnate to 2-pinnate-pinnatifid ..... 2. **A. aethiopicum**  
                       59b Lamina 1-pinnate to 2-pinnate:  
                         60a Rhizome paleae black; pinnae or pinnules trapeziform, variously lobed ..... 51. **A. simii**  
                         60b Rhizome paleae castaneous; pinnules obovate to broadly obovate ..... 37. **A. multifforme**  
                   57b Fronds spaced:  
                     61a Rhizome up to 4 mm in diameter:  
                       62a Rachis with scattered grey paleae; pinnules subulate with acutely toothed apex ..... 58. **A. uhligii**

- 62b Rachis with numerous black deciduous paleae; pinnules cuneate with sharply serrate rounded apex ..... 12. **A. buettneri**
- 61b Rhizome 4–7 mm in diameter:
- 63a Stipe as long or longer than the lamina ..... 50. **A. sebungweense**
- 63b Stipe shorter than the lamina ..... 53. **A. splendens**

1. **Asplenium adiantum-nigrum** L., Species plantarum 2: 1081 (1753); Sim: 148 (1892); Sim: 158 (1915). *Tarachia adiantum-nigrum* (L.) C.Presl: 82 (1851). Lectotype: Habitat in Europa australiore. R. Dodoens, Stirpium historiae pemptades sex sive libri: icon on page 466 (1616), designated by Fernandes (1983).

KEY TO THE VARIETIES:

- Lamina up to 150 mm long, 2-pinnate to shallowly 2-pinnate-pinnatifid; ultimate segments rounded and evenly dentate with numerous small teeth ..... 1.1. var. **adiantum-nigrum**
- Lamina up to 330 mm long, deeply 2-pinnate-pinnatifid to 3-pinnate; ultimate segments elongate and unevenly dentate with few large teeth ..... 1.2. var. **solidum**

1.1. var. **adiantum-nigrum**, Jacobsen: 363 (1983); Schelpe & Anthony: 199 (1986); Burrows: 244 (1990).

*Asplenium lucidum* Burm.f.: 28 (1768). Type: Cape, ?*Hermann s.n.* ex Herb. Burmann [G!, lecto., designated by Roux (1994b)].

*Asplenium tabulare* Schrad.: 916 (1818). Type: Cape, *Hesse s.n.* (LE, holo.).

*Asplenium argutum* Kaulf.: 176 (1824). Type: Habitat in Promontorio bonae spei, *Chamisso s.n.* (LE, holo.).

*Asplenium rawsonii* Baker: 362 (1872); Sim: 147 (1892); Sim: 157 (1915). Type: Cape Peninsula, Muizenberg Mountains, *Rawson s.n.* (K, holo.).

*Asplenium marlothii* Hieron.: 357, 358 (1911). Type: Britisch Betschuanaland: an schattigen steinigen Orten bei Kuruman 1 290 m ü. M., 02/1886, *R. Marloth 1095* (B, holo.; P, PRE, iso.).

*Asplenium adiantum-nigrum* L. var. *obtusum* (Willd.) Hook. & Baker: 214 (1874); Sim: 149 (1892); Sim: 159 (1915). Type: not located.

Chromosome number: n = 72 (Shivas 1969).

ILLUSTRATION: Schelpe & Anthony: t. 58, fig. 2 (1986).

Terrestrial or epilithic, in rock crevices, riverine scrub and forest margins, mostly in seasonally moist conditions, exposed or lightly shaded, 50–1 600 m.

DISTRIBUTION: Egypt, Cameroon, Kenya, Lesotho, South Africa and Tanzania. Also in Europe, Asia, Hawaii and Mexico.

1.2. var. **solidum** (Kunze) J.P.Roux, Cape Peninsula Ferns: 45 (1979); Jacobsen: 364 (1983); Schelpe & Anthony: 201 (1986); Burrows: 244 (1990). *Asplenium solidum* Kunze: 520 (1936); Sim: 150 (1892); Sim: 159 (1915). *Tarachia solida* (Kunze) C.Presl: 80 (1851). Type: Ruigtevallei, *Drège s.n.* [LZ, syn. t; BM!, lecto., designated by Schelpe & Anthony (1986)].

ILLUSTRATION: Burrows: t. 57, fig. 245, 245a, b (1990).

Terrestrial, among boulders or among low sclerophyllous scrub in deep dune sand along the coast, exposed or lightly shaded, 20–200 m.

DISTRIBUTION: South Africa.

var. **silesiacum** (Milde) Viane & Reichstein occurs in Iran

subsp. **yuanum** (Ching) Reichstein et al. occurs from eastern Europe to China, but also in Ethiopia and Réunion.

2. **Asplenium aethiopicum** (Burm.f.) Bech. in Candollea 6: 22 (1935); Schelpe: 181 (1970); Schelpe: 144 (1977); Schelpe & Diniz: 196 (1979); Jacobsen: 361 (1983); Schelpe & Anthony: 205 (1986); Burrows: 246 (1990). *Trichomanes aethiopicum* Burm.f.: 32 (1768). Type: Cape, *Burmman s.n.* coll. 248 (G!, holo.).

*Asplenium adiantoides* Lam.: 309 (1786), non (L.) C.Chr. (1905). Type: *Loco incerto, sine coll. s.n.* (P, syn.).

*Asplenium falsum* Retz.: 38 (1791). Type: Habitat in Africa, ad Bay Falso, *sine coll. s.n.* (not located).

*Asplenium furcatum* Thunb.: 172 (1800); Sim: 152 (1892). Type: e Cap b. Spei, *Thunberg s.n.* (UPS-THUNB 24806B!, lecto.).

*Asplenium praemorsum* sensu Sim:

KEY TO THE SUBSPECIES:

- 1a Reproduction apogamous; spores globose, spore length/width ratio <1.4 ..... 2.4. subsp. **filare**
- 1b Reproduction sexual; spores plano-convex, spore length/width ratio >1.4:
- 2a Fronds up to 1,25 m long, 3-pinnate; spore length <38 µm ..... 2.2. subsp. **tripinnatum**
- 2b Fronds smaller, up to 600 mm long, 2-pinnate to 2-pinnate-pinnatifid; mean spore length >38 µm:
- 3a Fronds up to 600 mm long, 2-pinnate to 2-pinnate-pinnatifid; pinnae trullate with usually more than 3 free pinnules, subcoriaceous; mean spore size 38–44 µm ..... 2.1. subsp. **aethiopicum**
- 3b Fronds up to 250 mm long, 2-pinnate; pinnae broadly trullate with 1 or 2 free pinnules, fleshy; mean spore size 46–49 µm ..... 2.3. subsp. **dodecaploideum**

2.1. subsp. **aethiopicum**

Chromosome number:  $n = 144$  (Braithwaite 1986).

**ILLUSTRATION:** Tardieu-Blot: t. 38, fig. 1, 2 (1953b).

Terrestrial, epilithic or low-level epiphyte, moist or seasonally moist forests, forest remnants and rocky outcrops, partially shaded, 50–1 800 m.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Ethiopia, Gabon, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, Sierra Leone, Somalia, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe.

2.2. subsp. **tripinnatum** (Baker) A.F.Braithw. in Botanical Journal of the Linnean Society 93: 366 (1986). *Asplenium furcatum* Thunb. var. *tripinnatum* Baker: 487 (1874a); Sim: 154 (1892); Sim: 164 (1915). *Asplenium praemorsum* Sw. var. *tripinnatum* sensu Sim: 164 (1915). Type: Natal, *Gerard* 592 [K, lecto., designated by Braithwaite (1986)].

Chromosome number:  $n = 72$  (Braithwaite 1986).

**ILLUSTRATION:** Braithwaite: t. 6, fig. A, B (1986).

Terrestrial, occasional in moist or seasonally moist forests and forest remnants, shaded, 50–2 000 m.

**DISTRIBUTION:** Mozambique, South Africa, Swaziland and Zimbabwe.

2.3. subsp. **dodecaploideum** A.F.Braithw. in Botanical Journal of the Linnean Society 93: 360 (1986). Type: South Africa, Transvaal, Pilgrims Rest Div., New Chum Falls c. 15 miles E of Pilgrims Rest, on south-facing rocks on river bank, c. 5 500 ft, *Braithwaite* 128 (K, holo.).

Chromosome number:  $n = 219$  (Braithwaite 1986).

**ILLUSTRATION:** Braithwaite: t. 8, f. A–D (1986).

Terrestrial, among boulders and in rock crevices in seasonally moist mountainous regions, exposed or partially shaded, 1 300–2 000 m.

**DISTRIBUTION:** Angola, Lesotho, South Africa, Zambia and Zimbabwe.

2.4. subsp. **filare** (Forssk.) A.F.Braithw. in Botanical Journal of the Linnean Society 93: 362 (1986). *Acrostichum filare* Forssk.: 184 (1775). *Asplenium filare* (Forssk.) Alston: 4 (1934). Type: Yemen, in sylvis montosis, *Forsskål* s.n. (missing).

*Asplenium canariense* Willd.: 239, 240 (1810). Type: Habitat in Teneriffa, *Broussonet* s.n. (not located).

**DISTRIBUTION:** Angola, Eritrea, Ethiopia, Guinea, Kenya, Lesotho, Somalia, South Africa, Swaziland, Uganda, Zambia, and Zimbabwe. Also in Arabia and the Canary Islands.

apomict **pseudofilare**.

Chromosome number:  $2n = 288$  (Braithwaite 1986).

**ILLUSTRATION:** Braithwaite: t. 11, fig. A–D (1986).

Terrestrial or epilithic, in seasonally moist forested kloofs and rocky outcrops, exposed or lightly shaded, 1 300–1 600 m.

**DISTRIBUTION:** Lesotho, South Africa and Swaziland.

apomict **transvaalense**.

Chromosome number:  $2n = 288$  (Braithwaite 1986).

**ILLUSTRATION:** Braithwaite: t. 12, fig. A, B (1986).

Terrestrial or epilithic, in seasonally moist forested kloofs and rocky outcrops, exposed or lightly shaded, 1 300–1 600 m.

**DISTRIBUTION:** South Africa.

apomict **capense**.

Chromosome number:  $2n = 360$  (Braithwaite 1986).

**ILLUSTRATION:** Braithwaite: t. 12, fig. C, D (1986).

Terrestrial or epilithic, in seasonally moist rock crevices in areas of low rainfall, exposed or partially shaded, 1 400–1 500 m, poikilohydrous.

**DISTRIBUTION:** South Africa.

3. **Asplenium africanum** Desv. in Magazin für de neuesten Entdeckungen in der gesammten Naturkunde, Gesellschaft naturforschender Freunde zu Berlin 5: 322 (1811); Schelpe: 136 (1977). Type: Habitat in rego Owariense Africes, *Palisot de Beauvois* s.n. (P, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 32, fig. 1, 2 (1953b).

Epilithic or epiphytic, in deeply shaded moist evergreen forests, 600–1 200 m.

**DISTRIBUTION:** Angola, Benin, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Kenya, Liberia, Niger, Nigeria, Príncipe, São Tomé, Sierra Leone, Tanzania and Uganda.

4. ***Asplenium albersii*** Hieron. in Botanische Jahrbücher für Systematik 46: 380, 381 (1911). Type: Deutsch-Ostafrika: auf dem Erdboden und an Baumstämmen des Urwaldes bei Kwai, 1 600–2 000 m hoch ü. M., 11/1899, *Albers* 289 (B, syn.); auf dem Gomba-Berge bei Kwai in 1 700 m Höhe ü. M., 29/12/1895, *Buchwald* 295 (B, syn.); bei Lutindi, 1902, *Liebusch* s.n. (syn.).

Epilithic, on moss covered rocks in forest margins in montane regions, lightly shaded, 1 700–1 900 m.

**DISTRIBUTION:** Kenya, Malawi and Tanzania.

5. ***Asplenium angolense*** Baker, Synopsis filicum, 2nd edn: 485 (1874a); Schelpe: 139 (1977). Type: Angola, Cuanza Norte, Golungo Alto, pr. Sange, mata de Quibanga, *Welwitsch* 96 (K, holo.; BM, LISU, iso.).

**ILLUSTRATION:** Schelpe: t. 26 (1977).

Terrestrial, in moist evergreen forests.

**DISTRIBUTION:** Angola.

6. ***Asplenium anisophyllum*** Kunze in Linnaea 10: 511 (1836); Sim: 142 (1892); Sim: 151 (1915); Schelpe: 170 (1970); Schelpe: 138 (1977); Schelpe & Diniz: 179 (1979); Jacobsen: 337 (1983); Schelpe & Anthony: 175 (1986); Burrows: 214 (1990). Type: Inter catarractum magnum et Omsamcaba, in valle rupestri umbrosa ad rivulum, 200 m, *Drège* s.n. [B!, lecto., designated by Roux (1986); K!, isolecto.].

*Asplenium geppii* Carr.: 269 (1901). Type: Angola. Pungo Andongo, in umbrosis sylvae primitiscum de Mata de Pongo, 04/1857, *Welwitsch* 97 (K, holo.; BM, iso.).

**ILLUSTRATIONS:** Fig. 17A; Schelpe & Anthony: t. 56, fig. 2 (1986).

Terrestrial, epilithic or low-level epiphyte, in deeply shaded moist evergreen forests, 200–1 850 m.

**DISTRIBUTION:** Angola, Kenya, Malawi, Mozambique, São Tomé, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

7. ***Asplenium atroviride*** Schelpe in Boletim da Sociedade Broteriana, Sér. 2, 41: 204 (1967); Schelpe: 173 (1970); Schelpe & Diniz: 182 (1979); Jacobsen: 336 (1983); Burrows: 219 (1990). Type: Rhodesia, Vumba Mountains. Witchwood, 4 200 ft, 27/06/1955, *Schelpe* 5446 (BOL!, holo., 3 sheets; BM, iso.).

**ILLUSTRATION:** Burrows: t. 49, fig. 219, 219a (1990).

Terrestrial, epilithic or low-level epiphyte, in deeply shaded moist evergreen forests, 1 200–1 700 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, Tanzania, Uganda and Zimbabwe.

8. ***Asplenium auritum*** Sw. in Journal für die Botanik 1800, 2: 52 (1801); Schelpe: 177 (1970); Schelpe & Diniz: 188 (1979); Jacobsen: 351 (1983); Burrows: 244 (1990). Type: Jamaica, *Swartz* s.n. (S, holo.).

**ILLUSTRATION:** Burrows: t. 57, fig. 246, 246a (1990).

Epilithic or epiphytic, in deeply shaded moist, or seasonally moist evergreen forests, 970–1 250 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Malawi, Mozambique, Tanzania and Zimbabwe. Also in the Madagascan region and tropical America.

9. ***Asplenium barteri*** Hook., A second century of ferns: t. 75 (1861). Type: Tropical Western Africa; Aboh, on trees in Baikie's Niger Exped. no. 1454, *Barter* s.n. (K, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 34, fig. 2 (1953b).

Terrestrial, in moist evergreen forests.

**DISTRIBUTION:** Angola, Benin, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Kenya, Liberia, Nigeria, Príncipe, São Tomé, Sierra Leone, Sudan and Uganda.

10. ***Asplenium blastophorum*** Hieron. in Botanische Jahrbücher für Systematik 46: 378 (1911); Schelpe: 183 (1970); Schelpe & Diniz: 198 (1979); Jacobsen: 358 (1983); Schelpe & Anthony: 201 (1986); Burrows: 251 (1990). Type: Sudan: im nördlichen Grenzbezirk zwischen dem Lande der Niamniam und Mombuttu, 15/03/1870, *Schweinfurth* 3295 [B, lecto., designated by Schelpe & Anthony (1986); BM, K, isolecto.].

Chromosome number:  $n = 144$  (Braithwaite 1972).



**ILLUSTRATION:** Tardieu-Blot: t. 36, fig. 5 (1953b).

Terrestrial, epilithic or epiphytic, in wet evergreen montane and riverine forests, moderately to deeply shaded, 600–1 250 m.

**DISTRIBUTION:** Burundi, Guinea, Kenya, Malawi, Mozambique, Nigeria, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

11. ***Asplenium boltonii*** Hook. ex Brause & Hieron., Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika-Expedition 1907–1908, 2: 8 (1910); Schelpe: 173 (1970); Schelpe & Diniz: 180 (1979); Jacobsen: 334 (1983); Schelpe & Anthony: 177 (1986); Burrows: 216 (1990). Type: Natal, *Bolton s.n.* (K, holo.; BM!, iso.).

**ILLUSTRATIONS:** Fig. 16M & N; fig. 17B; Schelpe & Anthony: t. 56, fig. 1 (1986).

Terrestrial, epilithic or epiphytic, in deeply shaded moist evergreen forests, 900–2 000 m.

**DISTRIBUTION:** Bioko, Kenya, Malawi, Mozambique, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. Also in the Madagascan region.

12. ***Asplenium buettneri*** Hieron., Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika-Expedition 1907–1908, Botany 2: 23, t. 2, fig. 2 (1910); Schelpe: 182 (1970); Schelpe & Diniz: 197 (1979); Jacobsen: 362 (1983); Burrows: 251 (1990). Type: Togo, bei Gbadsemme-Avatime nicht weit von Misahöhe an feuchten Felsen, 650 m ü. M., 07/1893, *E. Baumann* 42 (B, lecto.; P, isolecto.).

*Asplenium parablaspophorum* A.F.Braithw.: 5 (1972). Type: Southern Rhodesia, Melsetter District, Chimanimani Mountains. Forest on Timbiri River, ±1 mile from Haroni, 2000 ft, *Mitchell* 381 (BOL, holo.; SRGH, iso.).

Chromosome number:  $n = 72$  (Braithwaite 1972).

**ILLUSTRATION:** Tardieu-Blot: t. 38, fig. 3, 4 (1953b).

Epilithic or epiphytic, in moist evergreen montane forests, and deciduous miombo woodland, poikilohydrous, 650–1 200 m

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Central African Republic, Democratic Republic of the Congo, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

13. ***Asplenium chaseanum*** Schelpe in Boletim da Sociedade Broteriana, Sér. 2, 41: 206 (1967); Schelpe: 183 (1970). Type: Zambia, Fort Rosebery Distr., near Samfya Mission, 28/08/1952, *F. White* 3163 (BOL!, holo.; K, iso.).

Terrestrial or epilithic, in deep shade of evergreen forests, seasonally moist conditions, 1 150–1 650 m.

**DISTRIBUTION:** Democratic Republic of the Congo and Zambia.

14. ***Asplenium christii*** Hieron., Die Pflanzenwelt Ost-Afrikas und der Nachbargebiete: 82 (1895); Schelpe: 172 (1970); Jacobsen: 332 (1983); Schelpe & Anthony: 175 (1986); Burrows: 220 (1990). Type: Tanzania, Usambara. Silai, 1 110 m. In Tropenwald zahlreich beisammen stehend, *Holst* 2304 (B, holo.; K, iso.).

**ILLUSTRATIONS:** Fig. 17C; Schelpe & Anthony: t. 55, fig. 1 (1986).

Terrestrial, in wet evergreen forests, deeply shaded, 500–1 600 m.

**DISTRIBUTION:** Kenya, Mozambique, South Africa, Tanzania, Uganda and Zimbabwe.

15. ***Asplenium currorii*** Hook., Species filicum 3: 82 (1860); Schelpe: 137 (1977); Schelpe & Diniz: 178 (1979). *Asplenium africanum* Desv. var. *currorii* (Hook.) Tardieu: 172 (1953b). Type: West African coast, near Elephants Bay, *Curror s.n.* (K, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 25, fig. 1, 2 (1964a).

Epilithic or epiphytic, in moist deeply shaded evergreen forests, 600–1 200 m.

**DISTRIBUTION:** Angola, Cameroon, Côté d'Ivoire, Ghana, Guinea, Mozambique, Nigeria, Príncipe, São Tomé and Togo.

16. ***Asplenium dregeanum*** Kunze in Linnaea 10: 517 (1836); Sim: 156 (1892); Sim: 166 (1915); Schelpe: 184 (1970); Schelpe: 146 (1977); Schelpe & Diniz: 199 (1979); Jacobsen: 372 (1983); Schelpe & Anthony: 193 (1986); Burrows: 236 (1990). Type: Inter cataractam magnam et Omsamcaba, in valle rupestri umbrosissima, ad rupes secus rivulum, *Drège s.n.* [P, lecto., designated by Tardieu-Blot (1964a); BM, HBG, K!, isolecto.].

subsp. ***dregeanum***

**ILLUSTRATION:** Tardieu-Blot: t. 39, fig. 1, 2 (1953b).

Epilithic or epiphytic, in moist deeply shaded evergreen forests, 100–2 300 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Côté d'Ivoire, Democratic Republic of the Congo, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

subsp. **brachypterum** (Kunze ex Houlston & T.Moore) Pic.Serm. is confined to Central and West Africa.

17. **Asplenium emarginatum** P.Beauv., Flore d'Oware et de Bénin 2: 6, t. 61 (1808); Schelpe: 138 (1977). Type: Habitat in Owaria, Palisot de Beauvois s.n. (P-JU?, holo.; B-W, iso.).

ILLUSTRATION: Tardieu-Blot: t. 32, fig. 5, 6 (1953b).

DISTRIBUTION: Angola, Benin, Bioko, Burundi, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Kenya, Liberia, Nigeria, Principe, São Tomé, Sudan, Tanzania, Togo and Uganda.

18. **Asplenium erectum** Bory ex Willd., Species plantarum, 4th edn, 5: 328 (1810); Sim: 136 (1892); Schelpe: 175 (1970); Schelpe & Diniz: 184 (1979); Jacobsen: 345 (1983); Schelpe & Anthony: 190 (1986); Burrows: 223 (1990). *Asplenium lunulatum* Sw. var. *erectum* (Bory ex Willd.) Sim: 145 (1915). Type: Habitat in truncis arborum vetustarum insulae Borboniae, Bory de St. Vincent s.n. [B-W 19906, lecto., designated by Schelpe & Anthony (1986)].

*Asplenium sphenolobium* (Kunze) Hieron. var. *usambarense* Hieron.: 14 (1910). *Asplenium usambarense* (Hieron.) Hieron.: 227 (1918), nom. illeg. *Asplenium erectum* Bory ex Willd. var. *usambarense* (Hieron.) Schelpe: 207 (1967); Schelpe: 176 (1970); Schelpe & Diniz: 185 (1979); Jacobsen: 347 (1983); Schelpe & Anthony: 190 (1986); Burrows: 223 (1990). Type: Uganda, Butagu Valley, Mildbraed 2713 (B, holo.).

*Asplenium mutilatum* Kaulf.: 171, 172 (1824). Type: Habitat in Promontorio bonae spei, sine coll. s.n. (not located).

*Asplenium zeyheri* Pappe & Raws.: 18 (1858); Jacobsen: 348 (1983). *Asplenium erectum* Bory ex Willd. var. *zeyheri* (Pappe & Raws.) T.Moore: 127 (1859); Sim: 139 (1892). *Asplenium lunulatum* Sw. var. *zeyheri* (Pappe & Raws.) Sim: 139 (1892); Sim: 145 (1915). Type: Cape Province, Uitenhage, Rubidge s.n. (?BM, syn.); Near Philipstown, Kat River, Ecklon & Zeyher s.n. (?BM, syn.).

ILLUSTRATIONS: Fig. 17G; Schelpe & Anthony: t. 60, fig. 1, 1a (1986).

Terrestrial or epilithic, in deeply shaded moist evergreen forests, 50–1 800 m.

DISTRIBUTION: Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Ethiopia, Guinea, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

19. **Asplenium flexuosum** Schrad. in Göttingische gelehrte Anzeigen 1818: 916 (1818); Jacobsen: 336 (1983); Schelpe & Anthony: 179 (1986); Burrows: 233 (1990). *Asplenium gemmiferum* Schrad. var. *flexuosum* (Schrad.) Sim: 145 (1892); Sim: 155 (1915). Type: Cape, Hesse s.n. (?LE, holo.).

*Asplenium lucidum* Schtdl.: 25 (1826), p.p. non Burm.f. (1768), nec G.Forst. (1786), nec Salisb. (1796). Type: In Promontori bonae spei sylvis ad Hanglip, Mundt & Maire s.n. (not located).

*Asplenium discolor* Pappe & Raws.: 17 (1858), non Kunze (1834). *Asplenium gemmiferum* Schrad. var. *discolor* (Pappe & Raws.) Sim: 146 (1892); Sim: 156 (1915). Type: Knysna, Dalgairns s.n. (K, syn.); Albany, Atherstone s.n. (K, syn.); Philipstown, Katrivier, Ecklon & Zeyher s.n. (K, syn.).

*Asplenium gemmiferum* Schrad. var. *laciniatum* Mett.: 138 (1859b). Type: D.F.L. von Schlechtendal, Adumbrationes plantarum: t. 14b (1825a), Port Natal (icon).

ILLUSTRATIONS: Fig. 17E; Schelpe & Anthony: t. 58, fig. 1 (1986).

Terrestrial or epilithic, in moist deeply shaded forests, 50–1 400 m.

DISTRIBUTION: South Africa and Zimbabwe.

20. **Asplenium formosum** Willd., Species plantarum, 4th edn, 5: 329, 330 (1810); Schelpe: 179 (1970); Schelpe: 141 (1977); Schelpe & Diniz: 192 (1979); Jacobsen: 356 (1983); Burrows: 230 (1990). Type: Habitat in sylvis umbris ad Caracas, Bredemeyer s.n. (B-W 19908, holo.).

ILLUSTRATION: Tardieu-Blot: t. 37, fig. 3, 4 (1953b).

Epilithic or low-level epiphytes, deeply shaded in moist evergreen and riverine forests, 600–1 400 m.

DISTRIBUTION: Angola, Burundi, Cameroon, Côté d'Ivoire, Democratic Republic of the Congo, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, São Tomé, Sierra Leone, Tanzania, Togo, Zambia and Zimbabwe. Also in tropical America and the Indian subcontinent.

21. **Asplenium friesiorum** C.Chr. in Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem 9: 181 (1924); Schelpe: 178 (1970); Schelpe: 142 (1977); Schelpe & Diniz: 188 (1979); Jacobsen: 353 (1983); Schelpe & Anthony: 181 (1986); Burrows: 232 (1990). *Tarachia friesiorum* (C.Chr.) Momose: 321, fig. 33, 34 (1960). Type: Kenia occid.: pr. Forest Station, in silva densa terrestris, 2 300 m, 30/12/1921, R.E. & T.C.E. Fries 573 (B!, holo.; K, S, iso.).

*Asplenium serra* Langsd. & Fish. var. *natalense* Baker: 485 (1883b); Sim: 144 (1892). Type: Natal, Buchanan s.n. (K, holo.).

*Asplenium monilisorum* Domin: 7 (1927). Type: Natal, McKen & Buchanan 24 (K, holo.).

*Asplenium serra* sensu Sim: 153 (1915).

ILLUSTRATION: Schelpe & Anthony: t. 59, fig. 1, 1a, b (1986).

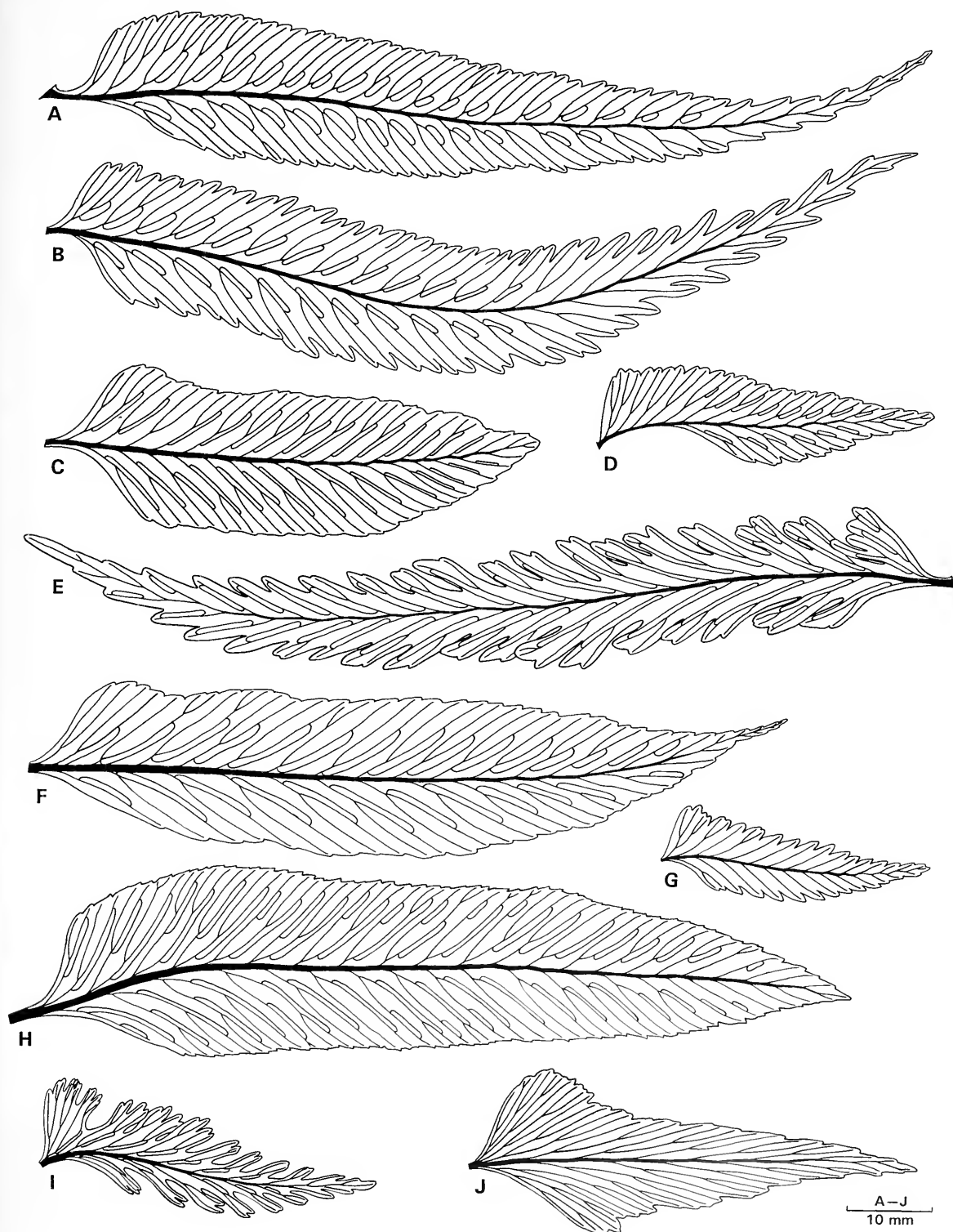


FIGURE 17A–J, Middle pinnae of *Asplenium* species. A, *Asplenium anisophyllum*, Schelpe 5633 (NBG); B, *A. boltonii*, Maguire 915 (NBG); C, *A. christii*, Taylor 3379a (NBG); D, *A. unilaterale*, Taylor 3380 (NBG); E, *A. flexuosum*, Compton 14343 (NBG); F, *A. gemmiferum*, Roux 1969 (NBG); G, *A. erectum*, Rudatis s.n. (NBG); H, *A. prionitis*, Roux 547 (NBG); I, *A. protensum*, Schelpe 5504 (NBG); J, *A. gemmascens*, Roux 2901 (NBG). Scale bar: A–J, 10 mm.

Terrestrial or epilithic, in moist evergreen forests or among boulders in montane grassveld, exposed or deeply shaded, 1 000–2 500 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Congo, Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

22. ***Asplenium gemmascens* Alston** in Boletim da Sociedade Broteriana, Sér. 2, 30: 10 (1956a); Schelpe: 143 (1977). Type: S. Nigeria, Ogoja Province, on ground in high forest, Ikwette-Balegette path, 4 200 ft, Savory & Keay *FHI* 25201 (BM, holo.).

*Asplenium torrei* Schelpe: 209 (1967); Schelpe: 180 (1970); Schelpe & Diniz: 193 (1979); Jacobsen: 358 (1983). Type: Mozambique, Manica & Sofala, Serra da Gorongosa, vertente do monte Nhandore, 1 320 m, 22/10/1965, A.R. Torre & Á. Pereira 12563 (LISC, holo.; LMU!, SRGH!, iso.).

**ILLUSTRATIONS:** Fig. 17J; Roux: fig. 1, t. A–H (2000a).

Terrestrial, in deeply shaded moist evergreen forests, 800–1 100 m.

**DISTRIBUTION:** Angola, Cameroon, Democratic Republic of the Congo, Guinea, Malawi, Mozambique, Nigeria, Rwanda and Uganda.

23. ***Asplenium gemmiferum* Schrad.** in Göttingische gelehrte Anzeigen 1818: 916 (1818); Sim: 145 (1892); Sim: 154 (1915); Schelpe: 173 (1970); Schelpe & Diniz: 181 (1979); Jacobsen: 335 (1983); Schelpe & Anthony: 179 (1986); Burrows: 216 (1990). Type: Cap. b. Sp., *M. Hesse s.n.* (GOET!, holo.).

**ILLUSTRATIONS:** Fig. 17F; Tardieu-Blot: t. 30, fig. 1, 2 (1964a).

Terrestrial, epilithic or low-level epiphyte in deeply shaded moist evergreen forests, 20–1 700 m.

**DISTRIBUTION:** Bioko, Cameroon, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, South Africa, Tanzania, Uganda and Zimbabwe. Also in East and West Africa and the Madagascan region.

24. ***Asplenium hemitomum* Hieron.** in Botanische Jahrbücher für Systematik 46: 365–367 (1911); Schelpe: 143 (1977). Type: Insel Fernando Po: auf Ölpalmen, Barter *s.n.* [B 016049, lecto., designated by Tardieu-Blot (1964a); K, isolecto.].

**ILLUSTRATION:** Tardieu-Blot: t. 36, fig. 1 (1953b).

Epiphytic, in moist evergreen forests.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Liberia, Nigeria, Príncipe, São Tomé, Sierra Leone and Tanzania.

25. ***Asplenium holstii* Hieron.** in Botanische Jahrbücher für Systematik 46: 348, 349 (1911); Schelpe: 170 (1970); Schelpe & Diniz: 177 (1979); Jacobsen: 331 (1983); Burrows: 214 (1990). *Asplenium africanum* Desv. var. *holstii* (Hieron.) Tardieu: 172 (1953b). Type: Deutsch-Ostafrika: an Baumstämmen des Urwaldes bei Bumbu-Fustii unweit Mashêua, 28/07/1893, Holst 8726 (B 19104, lecto. notula R. Viane); Im Waldgebirge Shagaia bei Mbaramu, 07/1829, Holst 3701 (B 16103 syn.).

**ILLUSTRATION:** Schelpe: t. 53, fig. (1970).

Epilithic or epiphytic, in moist evergreen forests, deeply shaded, 365–1 000 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, Tanzania, Uganda and Zimbabwe.

26. ***Asplenium hypomelas* Kuhn**, Filices africanae: 104 (1868), nom. nov. for *Davallia nigrescens* Hook.: t. 93 (1861), non *Asplenium nigrescens* Blume (1828); Schelpe: 187 (1970); Schelpe: 147 (1977); Schelpe & Diniz: 203 (1979); Jacobsen: 377 (1983); Schelpe & Anthony: 197 (1986); Burrows: 239 (1990). *Loxoscapha nigrescens* (Hook.) T.Moore: 297 (1861). Type: Ins. Fernando Po, G. Mann 448 (K, holo.).

*Davallia hollandii* Sim: 274 (1906). *Asplenium hollandii* (Sim) C.Chr.: 11 (1913); Sim: 173 (1915). Type: Rhodesia: prope Umtali, Holland *s.n.* (PRE, holo.; NBGI, iso.).

**ILLUSTRATION:** Schelpe & Anthony: t. 64, fig. 1, 1a (1986).

Low-level epiphyte, in deeply shaded moist evergreen forests, 1 500–2 250 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Congo, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Guinea, Kenya, Liberia, Malawi, Mozambique, Rwanda, São Tomé, Sierra Leone, South Africa, Sudan, Tanzania, Uganda and Zimbabwe.

27. ***Asplenium inaequilaterale* Willd.**, Species plantarum, 4th edn, 5: 322 (1810); Schelpe: 176 (1970); Schelpe: 139 (1977); Schelpe & Diniz: 185 (1979); Jacobsen: 347 (1983); Schelpe & Anthony: 191 (1986); Burrows: 222 (1990). Type: Habitat in insula Borboniae, Bory de St. Vincent *s.n.* (B-W 19896, holo.).

*Asplenium brachyotus* Kunze: 512 (1836). *Asplenium erectum* Bory ex Willd. var. *brachyotus* (Kunze) Sim: 138 (1892). *Asplenium laetum* Sw. var. *brachyotus* (Kunze) Bonap.: 60 (1925). Type: Ad catarractum magnam in praeruptis umbrosis inter Omsamcaba, 200 m, Drège *s.n.* [LZt; B!, lecto., designated by Roux (1986); BM!, K!, isolecto.].

*Asplenium suppositum* Hieron.: 353, 354 (1911). Type: Angola, an feuchten Felsen bei Pungo Andongo, 14/04/1875, Soyaux 234 (B-23252, holo.).

*Asplenium laetum* sensu Sim: 150 (1915), non Sw. (1806).

**ILLUSTRATION:** Tardieu-Blot: t. 34, fig. 4, 5 (1953b).

Terrestrial or epilithic, in moist evergreen forests, deeply shaded, 100–1 800 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Central African Republic, Democratic Republic of the Congo, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, São Tomé, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

28. ***Asplenium linckii* Kuhn**, *Filices africanae*: 22 (1868); Schelpe: 183 (1970); Jacobsen: 370 (1983); Burrows: 254 (1990). Type: In monte Kilimandjaro regionis Dschagga, 5 500–7 800 ft, *Kersten 40* (?B, holo.).

**ILLUSTRATION:** Burrows: t. 56, fig. 257, 257a, b (1990).

Epilithic, in moist deeply shaded evergreen forests, 1 400–1 600 m.

**DISTRIBUTION:** Burundi, Democratic Republic of the Congo, Kenya, Malawi, Rwanda, Tanzania, Uganda and Zimbabwe.

29. ***Asplenium lividum* Mett. ex Kuhn** in Linnaea 36: 100 (1869); Schelpe: 181 (1970); Schelpe: 143 (1977); Schelpe & Diniz: 195 (1979); Jacobsen: 360 (1983); Schelpe & Anthony: 205 (1986); Burrows: 248 (1990). Type: Venezuela, Aragua, Colonia Tovar, *Fendler 156* (B, holo.; F, MO, US, iso.).

**ILLUSTRATION:** Tardieu-Blot: t. 38, fig. 5 (1953b).

Epilithic or epiphytic, on moss covered boulders in moist, deeply shaded montane forests, 1 200–1 550 m.

**DISTRIBUTION:** Angola, Cameroon, Kenya, Malawi, Mozambique, São Tomé, Sierra Leone, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region and South America.

30. ***Asplenium lobatum* Pappe & Raws.**, *Synopsis filicum africae australis*: 22 (1858); Schelpe: 177 (1970); Schelpe & Diniz: 186 (1979); Jacobsen: 349 (1983); Schelpe & Anthony: 198 (1986); Burrows: 240 (1990). *Asplenium erectum* Bory ex Willd. var. *lobatum* (Pappe & Raws.) Sim: 139 (1892); Alston & Schelpe: 161 (1952). Type: In woods in British Kaffraria, *Espinasse s.n.* (BM, syn.); Albany, *Atherstone s.n.* (BM, syn.); In the Tzitsikamma, *Rubidge s.n.* (BM, syn.).

*Asplenium gracile* Pappe & Raws.: 22 (1858), non D. Don (1825). *Asplenium lunulatum* Sw. var. *gracile* (Pappe & Raws.) Sim: 146 (1915). *Asplenium erectum* Bory ex Willd. var. *gracile* (Pappe & Raws.) Tardieu: 222 (1958a). Type: In the primaeval forests of Natal, *Gueinzus s.n.* (S, holo.).

*Asplenium lobatum* Pappe & Raws. var. *pseudo-abyssinicum* N.C. Anthony & Schelpe: 149 (1982); Burrows: 240 (1990). Type: Mozambique, Manica & Sofala, Gorongosa Mountain, south-west sector, 4 000 ft, 07/07/1955, *Schelpe 5597* (BOLI, holo.; B, BM, M, MO, P, PR, PRE, iso.).

**ILLUSTRATION:** Schelpe & Anthony: t. 61, fig. 2, 2a (1986).

Terrestrial or epilithic, in moist or seasonally wet evergreen forests, deeply shaded, 1 000–1 800 m.

**DISTRIBUTION:** Malawi, Mozambique, South Africa, Swaziland and Zimbabwe. Also in Madagascar.

31. ***Asplenium loxoscapoides* Baker** in Transactions of the Linnean Society of London. Botany. Series 2: 354 (1887b); Schelpe: 187 (1970). Type: Kilimanjaro, 8 000 ft, 1884, *H.H. Johnston 43* (K, holo.).

Epilithic or low-level epiphytes, in moist evergreen forests, 2 000–2 300 m.

**DISTRIBUTION:** Kenya, Malawi, Tanzania and Uganda.

32. ***Asplenium lunulatum* Sw.** in Journal für die Botanik 1800, 2: 52 (1801); Jacobsen: 344 (1983); Schelpe & Anthony: 190 (1986); Burrows: 224 (1990). *Asplenium erectum* Bory ex Willd. var. *lunulatum* (Sw.) Sim: 40 (1891); Sim: 137 (1892); Sim: 143 (1915). Type: Cape Province, *Thunberg s.n.* (UPS, holo.).

*Asplenium falcatum* Thunb.: 172 (1800), non Lam. (1786), nec Retz. (1791). Type: e Cap b. Spei, *Thunberg s.n.* (UPS-THUNB 24818!, holo.).

*Asplenium erectum* Bory ex Willd. var. *minor* Sim: 40 (1891); Sim: 137 (1892). *Asplenium lunulatum* Sw. var. *minor* (Sim) Sim: 144 (1915). Type: Dohne Hill, Kaffraria, *Sim s.n.* (PRE, holo.).

**ILLUSTRATION:** Schelpe & Anthony: t. 60, fig. 3, 3a (1986).

Terrestrial or epilithic, mostly on or among rocks in screes and near streams in deeply shaded moist evergreen forests, 250–1 600 m.

**DISTRIBUTION:** Angola, Kenya, Malawi, Mozambique, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe.

33. ***Asplenium mannii* Hook.**, A second century of ferns: t. 60 (1861); Sim: 174 (1915); Schelpe: 187 (1970); Schelpe: 147 (1977); Schelpe & Diniz: 202 (1979); Jacobsen: 376 (1983); Burrows: 239 (1990). Type: Peak of Fernando Po, elev. 3 000 ft above the level of the sea, 1860, *G. Mann s.n.* (BM, holo.; K, iso.).

**ILLUSTRATION:** Schelpe: t. 54, fig. E1, 2 (1970).

Epilithic or epiphytic, in wet or seasonally wet evergreen forests, deeply shaded, poikilohydrous, 1 150–2 200 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Guinea, Kenya, Malawi, Mozambique, Rwanda, Sierra Leone, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

34. ***Asplenium megalura* Hieron.**, *Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika-Expedition 1907–1908*, Bot. 2: 17, 18 (1910); Schelpe: 180 (1970); Schelpe & Diniz: 194 (1979). Type: Usambara: am Stamm von Urwaldbäumen herabhängend, ohne genaueren Standort, 10/1891, *Holst* 83 (B 18034, lecto.).

**ILLUSTRATION:** Alston: t. 13, fig. A–C (1959).

Epiphytic, in deeply shaded wet evergreen forests.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Coté d'Ivoire, Democratic Republic of the Congo, Gabon, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Rwanda, São Tomé, Sierra Leone, Sudan, Tanzania, Togo, Uganda and Zambia.

35. ***Asplenium monanthes* L.**, *Mantissa plantarum* 1: 130 (1767a); Sim: 135 (1892); Sim: 141 (1915); Schelpe: 175 (1970); Jacobsen: 342 (1983); Schelpe & Anthony: 189 (1986); Burrows: 226 (1990). *Asplenium monanthemum* L.: 690 (1767b). Type: Habitat ad Cap b. spei, *sine coll. s.n.* (LINN 1250.17!, holo.).

**ILLUSTRATION:** Schelpe & Anthony: t. 62, fig. 1, 1a (1986).

Terrestrial or epilithic, in moist evergreen forests, deeply shaded, 200–2 400 m.

**DISTRIBUTION:** Bioko, Cameroon, Ethiopia, Kenya, Lesotho, Malawi, Rwanda, Somalia, South Africa, Sudan, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region, Macaronesia, the neotropics and the South Atlantic islands.

36. ***Asplenium mossambicense* Schelpe** in *Journal of South African Botany* 34: 235, t. 1 (1968); Schelpe: 172 (1970); Schelpe & Diniz: 180 (1979); Jacobsen: 333 (1983); Burrows: 218 (1990). Type: Mozambique, Manica & Sofala, Gorongosa Mountain (SW sector), 4 000 ft, 07/07/1955, *Schelpe* 5593 (BOL!, holo., 2 sheets; BM, iso.).

**ILLUSTRATION:** Burrows: t. 220, 220a (1990).

Epilithic, on moss covered boulders in moist evergreen forests, deeply shaded, 1 100–1 250 m.

**DISTRIBUTION:** Kenya, Mozambique and Zimbabwe.

37. ***Asplenium multiforme* Krasser** in *Annalen des K. K. Naturhistorischen Hofmuseums* 15: 1 (1900); Jacobsen: 368 (1983). Type: Griqualand East, Newmarket, 1/02/1895, *Krook s.n. in Penther* 31 (W!, holo.).

Chromosome number:  $n = 144$  (Braithwaite 1972).

**ILLUSTRATION:** Braithwaite: t. 3, fig. a–d (1972).

Terrestrial or epilithic, among boulders and low cliffs in montane grassland, exposed or partially shaded, 800–2 000 m.

**DISTRIBUTION:** Lesotho and South Africa.

38. ***Asplenium normale* D. Don**, *Prodromus florum nepalensis*: 7 (1825); Schelpe: 175 (1970); Schelpe & Diniz: 183 (1979). Type: Habitat ad Narainhetty Nepalensium, *Buchanan-Hamilton s.n.* (BM, holo.).

Terrestrial or epilithic, deeply shaded moist evergreen forests in montane regions, 1 700–2 000 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, Rwanda, Tanzania and Uganda. Also in Asia.

39. ***Asplenium obscurum* Blume**, *Enumeratio plantarum javae*: 181 (1828); Schelpe: 174 (1970); Schelpe & Diniz: 182 (1979); Jacobsen: 339 (1983); Burrows: 221 (1990). *Hymenasplenium obscurum* (Blume) Tagawa: 83 (1938a). Type: Java, *Blume s.n.* (L 51025, holo.).

**ILLUSTRATION:** Schelpe: t. 53, fig. G (1970).

Terrestrial or epilithic, in rocky streambeds and seepage areas in wet evergreen forests, deeply shaded, 1 200–2 150 m.

**DISTRIBUTION:** Malawi, Mozambique, South Africa, Tanzania and Zimbabwe. Also in the Madagascan region and Asia.

40. ***Asplenium pellucidum* Lam.**, *Encyclopédie méthodique. Botanique* 2: 305, 306 (1786). Type: l'île de France, *Commerçon s.n.* (P-JU, holo.).

subsp. ***pellucidum*** occurs in Mauritius.

subsp. ***pseudohorridum* (Hieron.) Schelpe** in *Boletim da Sociedade Broteriana*, Sér. 2, 41: 208 (1967); Schelpe: 179 (1970); Schelpe & Diniz: 190 (1979); Jacobsen: 355 (1983); Burrows: 230 (1990). *Asplenium protensum* Schrad. var. *pseudohorridum* Hieron.: 82 (1895). *Asplenium pseudohorridum* (Hieron.) Hieron.: 362, 363 (1911). Type: Usambara. *Holst* 2253, 4236 & 4269A (B 20445, 20449, syn.);

Deutsch-Ostafrika: von dem Bäumen herabhängend im Urwalde bei Kwa Kiniassi unweit Nderema, 23/04/1893, *Holst* 2253 (B 20446, syn.).

**ILLUSTRATION:** Schelpe & Diniz: t. 14, fig. 1–5 (1979).

Terrestrial, epilithic or low-level epiphytes, moist evergreen forests, deeply shaded, 700–1 350 m.

**DISTRIBUTION:** Mozambique, Tanzania and Zimbabwe.

41. ***Asplenium platyneuron* (L.) Britton, Sterns & Poggenb.**, Preliminary catalogue of Anthophyta and Pteridophyta reported as growing spontaneously within one hundred miles of New York City: 3 (1888); Sim: 140 (1915); Jacobsen: 343 (1983); Schelpe & Anthony: 189 (1986); Burrows: 226 (1990). *Acrostichum platyneuron* L.: 1069 (1753). Type: Habitat in Virginia, *Clayton s.n.* (missing).

*Asplenium ebeneum* sensu Sim: 134 (1892).

**ILLUSTRATION:** Schelpe & Anthony: t. 62, fig. 3 (1986).

Terrestrial, in seasonally dry forests and forest margins, lightly shaded, 100–2 400 m.

**DISTRIBUTION:** Lesotho and South Africa. Also in eastern North America and Jamaica.

42. ***Asplenium preussii* Hieron. ex Brause**, Wissenschaftliche Ergebnisse der Deutschen Zentral-Africa-Expedition 1907–1908, Bot. 2: 9, 10, t. 1D (1910); Schelpe & Anthony: 193 (1986); Burrows: 234 (1990). Type: Großer Kamerun-Berg, an Baumstämmen und feuchten Felsen an schattigen Stellen bei Buea, 800–1 600 m ü. M., 01/1891, *Preuss* 584 (B!, lecto.).

*Asplenium pseudoauriculatum* Schelpe: 206 (1967); Schelpe: 185 (1970); Schelpe & Diniz: 200 (1979); Jacobsen: 373 (1983). Type: Mozambique, Manica & Sofala, Garuso, Jaegersberg, 3 600 ft, 11/07/1955, *Schelpe* 5626 (BOL!, holo.; BM, iso.).

*Asplenium preussii* Hieron. subsp. *austroafricana* Schelpe: 208 (1967); Jacobsen: 373 (1983). Type: Natal, Nkandhla forest, 19/06/1946, *Schelpe* 1688 (BOL, holo.).

*Asplenium thunbergii* sensu Sim: 157 (1892).

*Asplenium auriculatum* sensu Sim: 167 (1915).

**ILLUSTRATION:** Tardieu-Blot: t. 39, fig. 3, 4 (1953b).

Terrestrial, frequent among rocks in seepage areas in deeply shaded evergreen forests, 1 000–1 650 m.

**DISTRIBUTION:** Bioko, Burundi, Cameroon, Congo, Democratic Republic of the Congo, Ethiopia, Guinea, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone, South Africa, Sudan, Tanzania, Uganda and Zimbabwe.

43. ***Asplenium prionitis* Kunze** in Linnaea 10: 511 (1836); Sim: 143 (1892); Sim: 152 (1915); Jacobsen: 338 (1983); Schelpe & Anthony: 175 (1986). Type: Inter Omtendo et Omsamculo, in nervose umbroso, sub 400 p., 1838, *Drège s.n.* [LZt; BM!, lecto., designated by Schelpe & Anthony (1986); B!, HBG, K!, isolecto.].

**ILLUSTRATIONS:** Fig. 17H; Schelpe & Anthony: t. 57, fig. 1 (1986).

Terrestrial, epilithic or low-level epiphyte, in wet coastal forests and swamp forests, deeply shaded, 20–200 m.

**DISTRIBUTION:** South Africa. Also in Madagascar.

44. ***Asplenium protensum* Schrad.** in Göttingische gelehrte Anzeigen 1818: 916 (1818); Sim: 141 (1892); Sim: 149 (1915); Schelpe: 179 (1970); Schelpe: 142 (1977); Schelpe & Diniz: 189 (1979); Jacobsen: 354 (1983); Schelpe & Anthony: 181 (1986); Burrows: 232 (1990). Type: Cape, *M. Hesse s.n.* (?LE, holo.).

**ILLUSTRATIONS:** Fig. 16O–Q & 17I; Tardieu-Blot: t. 37, fig. 5, 6 (1953b).

Terrestrial, epilithic or low-level epiphytes, in moist or seasonally moist evergreen forests, deeply shaded, 100–2 000 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, Kenya, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, Somalia, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

45. ***Asplenium pumilum* Sw.**, Nova genera & species plantarum: 129 (1788). Type: Jamaica, *Swartz s.n.* (S, holo.).

*Asplenium pumilum* Sw. subsp. *hymenophylloides* (Fée) Schelpe: 210 (1967); Schelpe: 178 (1970); Jacobsen: 352 (1983); Burrows: 255 (1990). *Asplenium pumilum* Sw. var. *hymenophylloides* Fée: 54 (1857). Type: Habitat in Abyssinia. In rupestribus umbris montium pr. Amba Sea, alt. 6 000 ft, 08/09/–, *W. Schimper s.n.* (W, iso.).

*Asplenium eylesii* Sim: 147 (1915). Type: Rhodesia, Mazoe, on west slope of Iron Mask Hill, 4 500–5 000 ft, 01/1909, *E. Eyles* 564 (PRE, holo.; SRGH!, iso.).

**ILLUSTRATION:** Burrows: t. 57, fig. 258, 258a (1990).

Terrestrial or epilithic, deciduous and dormant during the dry season, in riverine forests and deciduous miombo woodland, moderately shaded, 800–1 500 m.

**DISTRIBUTION:** Burundi, Malawi, Zambia and Zimbabwe. Madagascar the Indian subcontinent and the neotropics.

46. ***Asplenium ramlowii* Hieron.** in Botanische Jahrbücher für Systematik 46: 372, 373 (1911); Schelpe: 180 (1970); Schelpe & Diniz: 193 (1979); Jacobsen: 368 (1983); Burrows: 245 (1990). Type: Deutsch-Ostafrika: bei Tanga, vermutlich an Felsen, 1905, *Ramlow 16* (B 20701, holo.).

Chromosome number:  $n = 72$  (Braithwaite 1972).

**ILLUSTRATION:** Burrows: t. 57, fig. 247, 247a, b (1990).

Epilithic, in rock crevices and sheetrock mats on granite outcrops, exposed or lightly shaded, 900–1 500 m.

**DISTRIBUTION:** Malawi, Mozambique, Zambia and Zimbabwe.

47. ***Asplenium rutifolium* (P.J.Bergius) Kunze** in Linnaea 10: 521 (1836); Sim: 158 (1892); Jacobsen: 374 (1983); Schelpe & Anthony: 195 (1986); Burrows: 236 (1990). *Caenopteris rutifolium* P.J.Bergius: 249 (1786). Type: e Cap b. Spei, *Thunberg s.n.* (SBT!, holo.), as '*rutae-folium*'.

*Asplenium bipinnatum* (Forssk.) C.Chr.: 11 (1910); Sim: 169 (1915). *Lonchitis bipinnata* Forssk.: CXXIV, 184 (1775). *Asplenium rutifolium* (P.J.Bergius) Kunze var. *bipinnatum* (Forssk.) Schelpe: 194 (1964); Schelpe: 185 (1970); Schelpe & Diniz: 201 (1979). Type: Yemen: inter Bolghose et Mokhaja, 03/1763, *Forsskål 810* (C!, holo.).

*Adiantum achilleifolium* Lam.: 43 (1783), as '*achillaeafolium*'. *Asplenium achilleifolium* (Lam.) C.Chr.: 99 (1905), non Liebm. (1849). Type: Cap de Bonne-Espérance, *sine coll. s.n.* (not located).

**ILLUSTRATION:** Schelpe & Anthony: t. 65, fig. 1 (1986).

Epilithic or epiphytic, mostly in deeply shaded, moist evergreen forests, 50–2 000 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe. Also in Yemen and the Madagascan region.

48. ***Asplenium sandersonii* Hook.**, Species filicum 3: 147, t. 179 (1860); Sim: 132 (1892); Sim: 139 (1915); Schelpe: 183 (1970); Schelpe: 145 (1977); Schelpe & Diniz: 199 (1979); Jacobsen: 371 (1983); Schelpe & Anthony: 185 (1986); Burrows: 229 (1990). Type: Natal, ravine in Fields Hill, *Sanderson s.n.* (K, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 33, fig. 4, 5 (1953b).

Terrestrial, epilithic or epiphytic, in wet or seasonally wet forests, deeply shaded, 50–1 900 m.

**DISTRIBUTION:** Angola, Annobon, Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Ethiopia, Gabon, Kenya, Malawi, Mozambique, Nigeria, Rwanda, São Tomé, South Africa, Sudan, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region.

49. ***Asplenium schelpei* A.F.Braithw.** in Journal of South African Botany 38: 2 (1972). Type: South Africa, Transvaal, Pilgrims Rest Division, New Chum Falls nr. Pilgrims Rest. In rock crevices above the falls, 27/12/1960, *A.F. Braithwaite 140* (BML!, holo.; BOL!, iso.).

Chromosome number:  $n = 144$  (Braithwaite 1972).

**ILLUSTRATION:** Braithwaite: t. 1, fig. c–e (1972).

Terrestrial or epilithic, among boulders on rocky outcrops, exposed or partially shaded, 600–1 300 m.

**DISTRIBUTION:** South Africa and Zimbabwe.

50. ***Asplenium sebungweense* J.E.Burrows** in Bothalia 19: 173 (1989); Burrows: 248 (1990). Type: N. Zimbabwe, tributary of Busi River, 12 km NE of Lusulu, Grid. ref. NL 976095, terrestrial on shaded earth banks in riverine forest, near stream, occasional, poikilohydrous, 16/11/1982, *Craig, Mahlangu & Burrows 8* (PRE, holo.; Sengwa Herb., iso.).

**ILLUSTRATION:** Burrows: t. 59, fig. 249, 249a (1990).

Terrestrial, in seasonally moist riverine forests, deeply shaded, 800–1 000 m.

**DISTRIBUTION:** Zambia and Zimbabwe.

51. ***Asplenium simii* A.F.Braithw. & Schelpe** in Boletim da Sociedade Broteriana, Sér. 2, 41: 209 (1967); Schelpe: 181 (1970); Schelpe & Diniz: 195 (1979); Jacobsen: 369 (1983); Schelpe & Anthony: 203 (1986); Burrows: 250 (1990). Type: Rhodesia, Vumba Mts., Umtali District, Elephants Forest, epiphytic on tree boles 12 ft from forest floor, 5 300 ft, 28/12/1954, *N.C. Chase 6274* (BOL!, holo.; SRGH!, iso.).

*Asplenium cuneatum* Lam. var. *angustatum* Sim: 152 (1892); Sim: 162 (1915). *Asplenium splendens* Kunze var. *angustatum* (Sim) C.Chr.: 100 (1932a). Type: Knysna Forest, *Barkly s.n.* (SAM, 50586!, holo.).

**ILLUSTRATION:** Burrows: t. 60, fig. 251, 251a (1990).

Epilithic or epiphytic, in moist evergreen forests, deeply shaded, 150–1 700 m.

**DISTRIBUTION:** Kenya, Malawi, Mozambique, South Africa, Tanzania and Zimbabwe.



52. ***Asplenium smedsii*** Pic.Serm. in Webbia 32: 60 (1977c). Type: Ethiopia, Shashamane District.  $\pm$ 1 550 m. Road to Adaba. Epiphytic on tree overhanging watercourse, *De Joncheere ETS 50* (Herb. PIC.SERM. 26870, holo.).

ILLUSTRATION: Pichi Sermolli: t. 2; 62, fig. 3 (1977c).

Epilithic or epiphytic, in moist evergreen forests, deeply shaded, 1 500–1 700 m.

DISTRIBUTION: Democratic Republic of the Congo, Kenya, Malawi, Rwanda, Tanzania and Uganda.

53. ***Asplenium splendens*** Kunze in Linnaea 10: 516 (1836); Jacobsen: 365 (1983); Schelpe & Anthony: 201 (1986); Burrows: 252 (1990), p.p. *Tarachia splendens* (Kunze) C.Presl: 83 (1851). *Asplenium cuneatum* Lam. var. *splendens* (Kunze) Sim: 161 (1915). Type: Karakama and Katrivier, *Ecklon & Zeyher s.n.* [LZ†; holo.; S, lecto., designated by Schelpe & Anthony (1986)].

#### KEY TO THE SUBSPECIES:

Lamina ovate-acuminate to deltoid, 2-pinnate to 3-pinnate; pinnae with up to 14 cuneate-trapezoid pinnules ..... 53.1. subsp. **splendens**  
 Lamina oblong-lanceolate, narrowly ovate to narrowly triangular, 2-pinnate; pinnae with up to 5 cuneate-trapezoid pinnules ..... 53.2. subsp. **drakensbergense**

#### 53.1. subsp. **splendens**

Chromosome number:  $n = 72$  (Braithwaite 1972).

ILLUSTRATION: Burrows: t. 60, fig. 255, 255a (1990).

Terrestrial, epilithic or low-level epiphyte, in rock crevices on cliffs and in deeply shaded moist evergreen forests, 20–1 700 m.

DISTRIBUTION: South Africa and Swaziland.

53.2. subsp. **drakensbergense** A.F.Braithw. in Journal of South African Botany 38: 14, t. 1, fig. g–i; t. 2, fig. c (1972); Jacobsen: 366 (1983). Type: South Africa, Natal, Impendhle, near waterfall, 5 000 ft, *Edwards s.n.* (BM, holo.; BOL†, iso.).

Chromosome number:  $n = 72$  (Braithwaite 1972).

ILLUSTRATION: Braithwaite: t. 1, fig. g–i; 15, t. 2, fig. c (1972).

Terrestrial or epilithic, among boulders and in crevices of low cliffs in montane regions, partially shaded, 1 500–2 750 m.

DISTRIBUTION: Lesotho and South Africa.

54. ***Asplenium stoloniferum*** Bory, Voyage dans les quatre principales îles des mers d'Afrique 1: 329 (1804); Jacobsen: 370 (1983); Schelpe & Anthony: 187 (1986); Burrows: 229 (1990). Type: Réunion. Plaine de Chicots, *Bory de St. Vincent s.n.* (P!, holo.; BM, iso.).

*Asplenium dentatum* Krauss ex Pappe & Raws.: 17 (1858), non L. (1753). Type: Among rocks on the mountains of the Bosjesmansrand, Natal, *Krauss s.n.* (K, holo.; BM, iso.).

*Asplenium kraussii* T.Moore ex Hook.: 147 (1860); Sim: 131 (1892); Sim: 138 (1915). Type: Boschman's Rand, *Krauss 25* (K, holo.; BM, iso.).

ILLUSTRATION: Schelpe & Anthony: t. 61, fig. 3, 3a (1986).

Terrestrial, epilithic or low-level epiphytes, in moist, deeply shaded evergreen forests in montane regions, 1 200–2 000 m.

DISTRIBUTION: Lesotho and South Africa. Also in Réunion and South America.

55. ***Asplenium subintegrum*** C.Chr., Index filicum: 134 (1905), nom. nov. for *Asplenium coriaceum* Baker: 192 (1867c), non Bory (1833); Schelpe: 137 (1977). Type: Cameroon Mountains, *G. Mann 1387* (BM, holo.).

ILLUSTRATION: Tardieu-Blot: 28: t. 33, fig. 1, 2 (1953b).

DISTRIBUTION: Angola and Cameroon.

56. ***Asplenium theciferum*** (Humb., Bonpl. et Kunth) Mett. in Annales des Sciences Naturelles, Botanique, Sér. 5, 2: 227 (1864). *Davallia thecifera* Kunth: 23 (1816). *Loxoscaphe thecifera* (Humb., Bonpl. & Kunth) T.Moore: 302 (1861). Type: Venezuela, in monte Saraguen, *Humboldt & Bonpland s.n.* (P, holo.).

var. **theciferum** occurs in the neotropics.

var. **concinnum** (Schr.) Schelpe in Boletim da Sociedade Broteriana, Sér. 2, 41: 210 (1967); Schelpe: 188 (1970); Schelpe: 148 (1977); Schelpe & Diniz: 204 (1979); Jacobsen: 378 (1983); Schelpe & Anthony: 195 (1986); Burrows: 238 (1990). *Davallia concinna* Schrad.: 918 (1818); Sim: 64 (1892). *Loxoscape concinnum* (Schr.) T.Moore: 227 (1853). *Asplenium concinnum* (Schr.) Kuhn: 99 (1868). *Loxoscaphe theciferum* (Humb., Bonpl. et Kunth) T.Moore var. *concinnum* (Schr.) C.Chr.: 104 (1932b). Type: Capplant, *M. Hesse s.n.* (GOET!, holo.).

*Davallia campyloneura* Kunze: 544 (1836). Type: In sylva ad Plettenbergsbaai sec. fl. Klein Boschrivier, *Drège s.n.* (LZ†, holo.).

*Asplenium theciferum* sensu Sim: 171 (1915).

**ILLUSTRATION:** Schelpe: t. 54, fig. D1, 2 (1970).

Epilithic or epiphytic, poikilohydrous, in deeply shaded moist evergreen forests, 200–2 000 m.

**DISTRIBUTION:** Angola, Bioko, Burundi, Cameroon, Democratic Republic of the Congo, Equatorial Guinea, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

var. **schimperi** (Hook.) Pic.Serm. is confined to Burundi and Ethiopia.

57. **Asplenium trichomanes** L., Species plantarum 2: 1080 (1753); Sim: 133 (1892); Sim: 140 (1915); Schelpe: 174 (1970); Jacobsen: 341 (1983); Schelpe & Anthony: 187 (1986); Burrows: 228 (1990). Type: Habitat in Europae fissuris rupium, *sine coll. s.n.* Herb. Burser XX: 14 [UPS, lecto., designated by Viane (1994)].

subsp. **quadrivalens** D.E.Mey. emend. Lovis in Fern Gazette 9: 152 (1964). *Asplenium trichomanes* L. subsp. *quadrivalens* D.E.Mey.: 74: 456 (1962), nom. ambig. Type: Germany, Bavaria: Kienberg by Ruhpolding. D.E. Meyer s.n. Living in culture (Hort. Berol.), as sporophytes nr. 42, 43, 47 and 82.

Chromosome number:  $2n = 144$ . (J.Vogel, pers. comm.).

**ILLUSTRATION:** Schelpe & Anthony: t. 61, fig. 1, 1a (1986).

Terrestrial or epilithic, in rock crevices and in rock overhangs in montane grassland and moist evergreen forests at lower elevations, exposed or moderately shaded, 300–2 750 m.

**DISTRIBUTION:** Kenya, Lesotho, South Africa, Tanzania and Zimbabwe. Also in North Africa, Macaronesia, Britain and North America.

The *Asplenium trichomanes* complex is characterized by polyploidy comprising several taxa and hybrids that originated through auto- and allopolyploidy (Bennert & Fischer 1993).

subsp. **inexpectans**, **coriaceifolium**, **maderense** and **pachyrachis** are all confined to Europe and Madeira.

58. **Asplenium uhligii** Hieron. in Botanische Jahrbücher für Systematik 46: 374, 375 (1911); Burrows: 254 (1990). Type: Deutsch-Ostafrika: von Baumstämmen herabhängend oberhalb Moshi am Kilimandjaro, in einer Höhe von 2 100 m ü. M., *Uhlig 116* (B, syn.; P, isosyn.); von der Decke einer niedrigen feuchten Höhle oberhalb des Urwaldes über Kiboscho am Kilimandjaro herabhängend, in 3 200 m Höhe ü. M., 24/10/1901, *Uhlig 194* (B 24534, syn.).

**ILLUSTRATION:** Tardieu-Blot: t. 27, fig. 4 (1953b).

Epilithic, in moist forests and forest margins in montane regions, 1 400–1 800 m.

**DISTRIBUTION:** Bioko, Cameroon, Kenya, Malawi, Tanzania, Uganda and Zimbabwe.

59. **Asplenium unilaterale** Lam., Encyclopédie méthodique. Botanique 2: 305 (1786); Sim: 152 (1915); Schelpe: 174 (1970); Schelpe: 139 (1977); Jacobsen: 340 (1983); Burrows: 222 (1990). *Hymenasplenium unilaterale* (Lam.) Hayata: 712 (1927). Type: C. Plumier, Traité des fougères de l'Amerique: t. 65 (1705), icon.

**ILLUSTRATIONS:** Fig. 17D; Tardieu-Blot: t. 37, fig. 1, 2 (1953b).

Terrestrial or epilithic, in deeply shaded moist evergreen forests, 1 300–1 800 m.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Congo, Côté d'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Liberia, Malawi, Niger, Nigeria, Príncipe, São Tomé, Sierra Leone, Sudan, Tanzania, Uganda and Zimbabwe. Also in the Madagascan region and Asia.

60. **Asplenium variabile** Hook., Species filicum 3: 93, t. 185 (1860). Type: Fernando Po, *Barter s.n.* (K, holo.).

var. **variabile** is confined to West Africa.

var. **paucijugum** (Ballard) Alston in Boletim da Sociedade Broteriana, Sér. 2, 30: 7 (1956a); Schelpe: 138 (1977). *Asplenium paucijugum* Ballard: t. 3287 (1935). Type: Tanganjika Territory. Usambara. Gonja District, virgin forest, *Holst 4246* (K, holo.).

**ILLUSTRATION:** Tardieu-Blot: t. 32, fig. 7, 8 (1953b).

Epilithic, in seasonally moist evergreen forests.

**DISTRIBUTION:** Angola, Bioko, Cameroon, Central African Republic, Côté d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Kenya, Liberia, Príncipe, São Tomé, Sierra Leone, Sudan, Tanzania and Uganda. Also in Madagascar.

61. **Asplenium varians** Wall. ex Hook. & Grev., Icones filicum: t. 172 (1830b). Type: Habitat in rupibus Nepalensibus, *Wallich s.n.* [K, b only, lecto., designated by Sleep & Reichstein (1984)].

subsp. **variens**, a diploid taxon confined to north-western India, whereas subsp. **fimbriatum** is tetraploid.

subsp. **fimbriatum** (Kunze) Schelpe in Boletim da Sociedade Broteriana, Sér. 2, 41: 211 (1967); Schelpe: 177 (1970); Schelpe & Diniz: 187 (1979); Jacobsen: 350 (1983); Schelpe & Anthony: 198 (1986); Burrows: 242 (1990). *Asplenium fimbriatum* Kunze: 117 (1844b). Type: Unico loco inter Omfondi et Tagela portus Natalensis in sylva umbrosa lateralis montis ad saxa umbrosa, 02–04/1842, Gueinzius s.n. (W, holo.; HBG, K, iso.).

*Asplenium varians* sensu Sim: 140 (1892); Sim: 146 (1915).

**ILLUSTRATION:** Schelpe & Anthony: t. 65, fig. 2 (1986).

Terrestrial, epilithic or low-level epiphytes, in moist and seasonally moist evergreen forests, deeply shaded, 970–1 850 m.

**DISTRIBUTION:** Democratic Republic of the Congo, Kenya, Lesotho, Mozambique, South Africa, Tanzania, Uganda and Zimbabwe.

**Asplenium aethiopicum** subsp. **aethiopicum** x **A. aethiopicum** subsp. **tripinnatum** A.F.Braithw. in Botanical Journal of the Linnean Society 93: 368 (1986).

Chromosome number:  $n = 108$ , meiosis irregular (Braithwaite 1986).

**ILLUSTRATION:** Braithwaite: t. 13, fig. A, B (1986).

**DISTRIBUTION:** South Africa.

### Suborder MARSILEINEAE

The monophyly of the heterosporous water ferns is supported by morphological and fossil evidence (Rothwell & Stockey 1994) as well as molecular data (Hasebe et al. 1994; Hasebe et al. 1995; Pryer 1999).

33. **MARSILEACEAE** Mirb., Histoire naturelle des végétaux, classés par familles 5: 126 (1803b). Type: *Marsilea* L.

Plants aquatic or semi-aquatic. *Rhizome* solenostelic, widely creeping, branched; root cortex parenchymatous throughout or with an inner sclerenchymatic cortex. *Fronde*s approximate to widely spaced, circinate; stipe slender, terete; lamina 1-pinnate, with two pinna pairs, pseudo-palmate, floating in submerged plants; amphistomatic, stomata sunken, mostly of the diacytic type; venation reticulate. *Indumentum* composed of uniseriate acicular hairs that are ventrally attached near the base, occurring on the rhizome axes, lamina and sporocarps. *Sporocarps* inserted on short pedicels on the stipe (usually at the bases). *Sori* borne in parallel rows inserted on a long hygroscopic 'rachis', heterosporangiate, without a dehiscing mechanism, microsporangia with numerous microspores; megasporangium with a single megaspore. Chromosome number based on  $2n = 40$ .

Modern *Marsilea* dates from the mid-Cretaceous (Skog & Dilcher 1992). The Marsileaceae have traditionally been placed near the schizaeoid ferns, because of several similar anatomical and morphological features. The affinity with this group of ferns is remote, but may well have derived from a common ancestor. (\* see Addendum 2).

**0203100 MARSILEA** L., Species plantarum 2: 1099 (1753). Lectotype: *Marsilea quadrifolia* L., typ. cons., designated by Christensen (1905).

Generic description as for the family. A near-cosmopolitan genus of approximately 65 species.

**KEY TO THE SPECIES:** - based on Launert (1984).

- 1a Sporocarps 4 to many arranged in a single or double row along the stipe ..... 12. **M. minuta**
- 1b Sporocarps not in a row along the stipe, if attached to the stipe then solitary or in pairs, or in branched clusters:
  - 2a Sporocarps in dichotomously branched clusters from a peduncle-like base ..... 7. **M. ehippiocarpa**
  - 2b Sporocarps solitary or in small groups, the pedicels free from each other, or fused at the base, but never dichotomously branched:
    - 3a Leaflets with pellucid sclerenchymatic interstitial streaks (when no leaflets are available continue with the alternative):
      - 4a Superior tooth of the sporocarp absent or indicated as a brownish circular spot; inferior tooth prominent; sporocarps brownish tomentose, crowded at the stipe base; pedicels pig-tail like curved ..... 6. **M. distorta**
      - 4b Superior tooth always present, obtuse or acute, inferior present or absent; sporocarps appressed pilose, becoming gradually glabrous:
        - 5a Sporocarps distinctly bordered, lateral ribs almost always visible, dorsally straight or somewhat convex; teeth more or less equal ..... 5. **M. coromandelina**
        - 5b Sporocarps not bordered, lateral ribs invisible in mature sporocarps; inferior tooth obtuse to almost absent; superior tooth prominent, up to 1 mm long, acute ..... 9. **M. fenestrata**
    - 3b Leaflets without pellucid streaks:
      - 6a Sporocarps black, usually glossy; outer layer of the epidermis becoming detached and peeling ..... 13. **M. nubica**
      - 6b Sporocarps brown or rarely blackish, not glossy; outer layer of the epidermis never detached:
        - 7a Sporocarps with hairs of 2 kinds: erect cylindrical hairs and appressed flattened hairs ..... 8. **M. farinosa**
        - 7b Sporocarps only with laterally attached hairs:
          - 8a Sporocarps almost square in lateral view, distally truncate, with a distinct frontal furrow and laterally with a broad dorso-ventral furrow ..... 1. **M. aegyptiaca**

- 8b Sporocarps longer than high, or if almost square then never laterally with a broad lateral dorso-ventral furrow:
- 9a Pedicels growing horizontally or more often downwards, burying the sporocarps in the ground:
- 10a Sporocarps always tomentose, even when fully mature, usually densely crowded; superior tooth absent or present as a dark circular spot; pedicels slender, repeatedly pigtail-like curved ..... 6. **M. distorta**
- 10b Sporocarps with appressed hairs, villose or rarely tomentose, becoming glabrous with age; superior tooth present; pedicels straight or gently curved:
- 11a Veins of the inferior sporocarp wall not anastomosing; sporocarps densely appressed pilose to villous, sometimes tomentose, 5–7 mm long, 4–5 mm high; inferior tooth absent or developed as a shallow hump only ..... 17. **M. vera**
- 11b Veins of the inferior wall of the sporocarp anastomosing; sporocarps appressed pilose or glabrous, rarely villous, 3–5.5 mm long; inferior tooth short, obtuse; superior tooth subacute to acute:
- 12a Sporocarps 3.8–5.5 mm long, 3–4.5 mm high, up to 3.8 mm thick, superior tooth distinct, acute to subacute; pedicels 8–15 mm long, slender, gently curved ..... 10. **M. gibba**
- 12b Sporocarps 3–3.5 mm long, 2.25–2.8 mm high, up to 2.7 mm thick; superior tooth inconspicuous, usually obtuse; pedicels 2–5 mm long, stout, straight or sharply curved .... 15. **M. subterranea**
- 9b Pedicels growing upright or ascending:
- 13a 2–4 pedicels united at their bases but not branched:
- 14a Both teeth of the sporocarps distinct ..... 12. **M. minuta**
- 14b Only the superior tooth of the sporocarp present, subobtuse to acute; inferior tooth absent or rarely appearing as a shallow hump ..... 2. **M. apposita**
- 13b Pedicels always free:
- 15a Both sporocarp teeth present, often differing in size:
- 16a Mature sporocarps usually dark-brown to almost black, lateral ribs inconspicuous or absent; superior tooth as long or slightly longer than the inferior; pedicels 3–7 mm long ..... 12. **M. minuta**
- 16b Mature sporocarps greyish-brown or brown, lateral ribs usually visible; pedicels 5–15 mm long:
- 17a Sporocarps 2–3.75 mm long, 1.5–2.7 mm high, up to 1.75 mm thick, both teeth of almost equal length, inferior tooth often pointed downwards; superior tooth obtuse to subacute; veins of the inferior wall not anastomosing ..... 5. **M. coromandelina**
- 17b Sporocarps 3.8–5.5 mm long, 3–4.5 mm high, to 3.8 mm thick, the inferior tooth much smaller than the superior, obtuse, veins of the interior wall anastomosing ..... 10. **M. gibba**
- 15b Only the superior tooth of the sporocarp developed, obtuse or acute, inferior absent or present as a shallow hump:
- 18a Sporocarps narrowly rectangular in lateral view, biscociform in dorso-ventral cross-section, usually with a dorsal, frontal and ventral furrow:
- 19a Sporocarps bean- or lozenge-shaped, 4.5–7 mm long, 3–4.8 mm high, biscociform in dorso-ventral cross-section, thicker above than below; superior tooth conspicuously acute ..... 16. **M. unicornis**
- 19b Sporocarps obtusely rectangular to square in lateral view, rarely bean-shaped, 2.4 mm long, 1.5–3.2 mm high, rectangular in dorso-ventral cross-section; superior tooth short, broadly conical, acute to subobtuse ..... 2. **M. apposita**
- 18b Sporocarps narrowly elliptic, subcircular, or rarely slightly biscociform in dorso-ventral cross-section, without a dorsal or frontal furrow:
- 20a Sporocarps very small, inflated, pear-shaped to subglobular, 1.25–2.5 mm long, densely crowded ..... 3. **M. burchellii**
- 20b Sporocarps larger, 2.7–7 mm long, usually not crowded:
- 21a Superior tooth of the sporocarp always obtuse, usually very short:
- 22a Sporocarps almost sessile, often deflexed against the 1.4 mm long pedicel; leaflets densely villous or tomentose when young, later thinly tomentose ..... 18. **M. villifolia**
- 22b Sporocarps distinctly pedicelled, appressed pilose; leaflets pilose, glabrous with age ..... 11. **M. macrocarpa**
- 21b Superior tooth of the sporocarp acute to subacute:
- 23a Pedicel 15–45 mm long, slender, sometimes inserted above the base of the stipe; sporocarp 4.5–7 mm long ..... 14. **M. schelpiana**
- 23b Pedicels 2–12 mm long; sporocarps to 4.25 mm long:
- 24a Sporocarps bean-shaped, 3.5 mm long; superior tooth prominent, up to 1.5 mm long, narrowly cone-shaped ..... 9. **M. fenestrata**
- 24b Sporocarps variable in shape,  $\pm$  rectangular to broadly elliptic-rectangular, irregularly rhombic to axe-shaped in lateral view ..... 4. **M. capensis**

1. **Marsilea aegyptiaca** Willd., Species plantarum, 4th edn, 5: 540 (1810); Launert: 11.3 (1969); Launert: 62 (1970); Jacobsen: 481 (1983); Schelpe & Anthony: 61 (1986); Burrows: 73 (1990). Type: Habitat in Aegyptio, *sine coll. s.n.* (missing); suggested 'standard specimen': Prope Abu-Zabel, 01/1835, Schimper & Wiest 33 (BM, BR, FR, K, L, M, PRC), designated by Launert (1968).

ILLUSTRATION: Launert: t. 18, fig. E1–3 (1970).

River and streambeds, also calcareous pans, exposed, 700–2 000 m.

DISTRIBUTION: Botswana, Egypt, Ethiopia, Lesotho, Namibia, South Africa, Sudan and Tunisia. Also in Madagascar and India.

2. **Marsilea apposita** Launert in Senckenbergiana Biologica 49: 306 (1968); Launert: 65 (1970); Jacobsen: 485 (1983); Schelpe & Anthony: 63 (1986); Burrows: 76 (1990). Type: Rhodesia, Matopo Hills, 1905, Gibbs 289 (BM!, hol.; BOL!, iso.).

**ILLUSTRATION:** Launert: t. 5, fig. 22 (1984).

Along streambanks and at the edge of seasonal pools, 200–1 400 m.

**DISTRIBUTION:** Botswana, South Africa and Zimbabwe.

3. **Marsilea burchellii** (Kunze) A.Braun in Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin 1863: 429 (1864); Sim: 258 (1892); Launert: 11.3 (1969); Launert: 66 (1970); Jacobsen: 488 (1983); Schelpe & Anthony: 65 (1986); Burrows: 79 (1990). *Marsilea quadrifolia* L. var. *burchellii* Kunze: 556 (1836). *Zalusianskya burchellii* (Kunze) Kuntze: 823 (1891). *Marsilea macrocarpa* C.Presl var. *burchellii* (Kunze) Sim: 315 (1915). Type: In Africa australi, *Burchell*, Cat. no. 1625 (B!, holo.; K!, iso.).

*Marsilea biloba* Willd.: 540, 541 (1810). *Marsilea macrocarpa* C.Presl var. *biloba* (Willd.) Sim: 315 (1915). Type: Habitat ad Cap. b. spei prope Musselbay, *Meuron s.n.* (B-W 20257, holo.).

**ILLUSTRATION:** Launert: t. 18, fig. C1, 2 (1970).

In seasonal vleis and at the edge of pools, 20–1 500 m.

**DISTRIBUTION:** Botswana, Namibia and South Africa.

4. **Marsilea capensis** A.Braun in Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin 1863: 428 (1864); Sim: 259 (1892); Launert: 66 (1970); Jacobsen: 487 (1983); Schelpe & Anthony: 64 (1986); Burrows: 78 (1990). *Marsilea macrocarpa* C.Presl var. *capensis* (A.Braun) Sim: 316 (1915). Type: S-Africa, Cape Province, 1844, *Drège s.n.* [B!, lecto., designated by Launert (1968)].

**ILLUSTRATION:** Launert: t. 18, fig. D1, 2 (1970).

Aquatic or semi-aquatic in seasonal pans and vleis, 20–1 500 m.

**DISTRIBUTION:** Egypt, Namibia, South Africa and Zambia.

5. **Marsilea coromandelina** Willd., Species plantarum, 4th edn, 5: 539 (1810); Launert: 11.3 (1969); Launert: 54 (1977); Launert & Diniz: 62 (1979); Jacobsen: 477 (1983); Schelpe & Anthony: 59 (1986); Burrows: 68 (1990). Type: India, Coromandel coast, Tranquebar, *Klein s.n.* (B-W 20253, holo.).

*Marsilea trichocarpa* Bremekamp: 234 (1933). Type: South Africa, Zoutpansberg Distr., Pietersburg, Vivo-vlei, *Bremekamp & Schweickerdt* 193 (PRE, holo.; BM, iso.).

**ILLUSTRATION:** Launert: t. 2, fig. 9A–C (1984).

Seasonal or temporal vleis and pans and at the edge of lakes and rivers, 20–1 000 m.

**DISTRIBUTION:** Angola, Botswana, Burundi, Kenya, Mauritania, Mozambique, Namibia, Senegal, South Africa, Sudan, Tanzania and Zimbabwe. Also in Madagascar.

6. **Marsilea distorta** A.Braun in Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin 1863: 433 (1864); Launert & Diniz: 61 (1979); Jacobsen: 476 (1983); Schelpe & Anthony: 59 (1986); Burrows: 68 (1990). Type: Senegal, near Dagana-Ouallo, *Leprieur s.n.* (B, holo.; FR, L, P, iso.).

**ILLUSTRATION:** Launert: t. 2, fig. 8A–C (1984).

Seasonally flooded areas, swamp and lake shores, 50–400 m.

**DISTRIBUTION:** Liberia, Mauritania, Mozambique, Namibia, Senegal, Sudan, Tanzania and Zimbabwe.

7. **Marsilea ephippiocarpa** Alston in Journal of Botany 68: 118 (1930); Launert: 11.3 (1969); Launert: 62 (1970); Launert: 54 (1977); Launert & Diniz: 57 (1979); Jacobsen: 478 (1983); Schelpe & Anthony: 60 (1986); Burrows: 70 (1990). Type: Southern Rhodesia, near Fort Victoria, *Rendle* 307 (BM!, holo.).

**ILLUSTRATION:** Launert: t. 17, fig. A1–7 (1970).

Mostly in seasonally flooded areas, but also at lake edges, 20–1 200 m.

**DISTRIBUTION:** Angola, Botswana, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.

8. **Marsilea farinosa** Launert in Senckenbergiana Biologica 49: 298 (1968); Launert: 11.4 (1969); Launert: 65 (1970); Launert: 55 (1977); Launert & Diniz: 60 (1979); Jacobsen: 481 (1983); Schelpe & Anthony: 61 (1986); Burrows: 73 (1990). Type: SW-Africa, Grootfontein, 13/07/1934, *Schönfelder s.n. in Herb. Dinter* 7688 (M, holo.; B, BM!, BOL!, FR, K, PRE, WIND, iso.).

#### KEY TO THE SUBSPECIES:

- Sporocarps held at c. 90° to the pedicel; pedicels arise from the stipe only ..... 8.1. subsp. **farinosa**  
 Sporocarps held at c. 180° to the pedicel; pedicels arise from both the stipe base and the stipe 'axil' ..... 8.2. subsp. **arrecta**

8.1. subsp. **farinosa**

**ILLUSTRATION:** Launert: t. 17, fig. C1–3 (1970).

Riverbeds and seasonal vleis and pans, 500–1 800 m.

**DISTRIBUTION:** Angola, Botswana, Ethiopia, Kenya, Mozambique, Namibia, South Africa, Tanzania and Zimbabwe.

8.2. subsp. **arrecta** J.E.Burrows in Bothalia 19: 169 (1989); Burrows: 74 (1990). Type: NW. Transvaal, 40 km S of Groblersbrug on Potgietersrus road, (2328AA), 900 m, in shallow man made depressions in low *Acacia* woodland scrub, 31/03/1985, Burrows 3597 (BOL!, holo.; J, K, PRE, iso.).

**ILLUSTRATION:** Burrows: t. 17, fig. 69c (1990).

In mud in seasonally flooded pans and man-made depressions.

**DISTRIBUTION:** Botswana and South Africa.

9. **Marsilea fenestrata** Launert in Mitteilungen der Botanischen Staatssammlung München 3: 507 (1960); Launert & Diniz: 64 (1979); Jacobsen: 480 (1983); Schelpe & Anthony: 61 (1986); Burrows: 72 (1990). Type: South Africa, Zululand, Lower Umfolozi Distr., Umfolozi Game Reserve, 500 ft, 07/12/1954, C.J. Ward 2458 (BOL!, holo.; BM!, NPB, NU, iso.).

**ILLUSTRATION:** Launert: t. 3, fig. 15A–C (1984).

In mud on the edge of seasonal pans, 120–200 m.

**DISTRIBUTION:** Mozambique, South Africa and Swaziland.

10. **Marsilea gibba** A.Braun in Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin 1870: 745 (1871). Type: Sudan, Agada, Schweinfurth 2462 (B, holo.; BM, FR, M, iso.).

**ILLUSTRATION:** Launert: t. 1, fig. 4 (1984).

**DISTRIBUTION:** Angola, Central African Republic, Congo, Kenya, Mali, Rwanda, Sudan, Tanzania and Uganda.

11. **Marsilea macrocarpa** C.Presl in Abhandlungen der Böhmisches Gesellschaft der Wissenschaften 3: 580 (1845a); Sim: 259 (1892); Sim: 314 (1915); Launert: 11.4 (1969); Launert: 64 (1970); Launert: 56 (1977); Jacobsen: 482 (1983); Schelpe & Anthony: 62 (1986); Burrows: 74 (1990). Type: South Africa, Cape Province, Drège s.n. (PRC, holo.; B!, iso.).

*Marsilea dregeana* A.Braun: 428 (1864). Type: As for *Marsilea macrocarpa* C.Presl.

*Marsilea rotundata* A.Braun: 200 (1868). Type: Angola, districtus Huila in stagnis juxta rivum de Mumpulla, Welwitsch 171 (B, holo.; BM, iso.).

**ILLUSTRATION:** Launert: t. 17, fig. D1, 2 (1970).

In permanently running water or seasonal vleis and pans, dormant during the dry season, 20–1 800 m.

**DISTRIBUTION:** Angola, Botswana, Kenya, Lesotho, Namibia, South Africa, Uganda, Zambia and Zimbabwe.

12. **Marsilea minuta** L., Mantissa plantarum, altera: 308 (1771b); Launert: 60 (1970); Launert: 55 (1977); Launert & Diniz: 55 (1979); Jacobsen: 479 (1983); Schelpe & Anthony: 60 (1986); Burrows: 72 (1990). Type: India, sine coll. s.n. (LINN 1254.6, holo.).

*Marsilea diffusa* Lepr. var. *cornuta* A.Braun: 199 (1868). *Marsilea cornuta* A.Braun: 728 (1871). Type: Angola, Mossamedes, Bero prope Caponda and Cavalheiros, Welwitsch 173 (B, holo.; BM, BO, iso.).

var. **minuta**

**ILLUSTRATION:** Launert: t. 17, fig. B (1970).

Seasonally flooded or moist areas and lake edges, 20–1 000 m.

**DISTRIBUTION:** Algeria, Angola, Benin, Botswana, Burundi, Central African Republic, Congo, Democratic Republic of the Congo, Egypt, Ghana, Guinea Bissau, Kenya, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Also in the Madagascan region.

var. **incurva** (A.Braun) Launert is confined to tropical West Africa.

13. **Marsilea nubica** A.Braun in Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin 1863: 432 (1864); Launert: 11.4 (1969); Launert: 57 (1977); Launert & Diniz: 58 (1979); Jacobsen: 475 (1983); Schelpe & Anthony: 57 (1986); Burrows: 67 (1990). *Zalusianskya nubica* (A.Braun) Kuntze: 823 (1891). Type: Ad montem Cordofanum Arasch-Cool in stagnis pluvialibus, Kotschy 126 (B, holo.; BM, FR, L, M, PRC, iso.).

#### KEY TO THE VARIETIES:

Sporocarps with the long axis at a right angle to the pedicel or nearly so; broadly rectangular to almost square in lateral view ..... 13.1. var. **nubica**

Sporocarps with the long axis at a downward pointing angle to the pedicel; broadly or narrowly deltate or rarely semicircular in lateral view ..... 13.2. var. **gymnocarpa**

13.1. var. **nubica**

ILLUSTRATION: Launert: t. 1, fig. 6A, B (1984).

Seasonal ponds, pans and vleis, 20–1 600 m.

DISTRIBUTION: Angola, Botswana, Mauritania, Mozambique, Namibia, Senegal, Sudan and Tanzania. Also in Madagascar.

13.2. var. **gymnocarpa** (Lepr. ex A.Braun) Launert in Garcia de Orta, Sér. Bot. 6: 124 (1984); Burrows: 67 (1990). *Marsilea gymnocarpa* Lepr. ex A.Braun: 432 (1864). Type: Senegal, Leprieur s.n. in Herb. Perrotet 182 (P, holo.; BM, iso.).

ILLUSTRATION: Launert: t. 2, fig. 7A, B (1984).

Terrestrial, in seasonally flooded pans, ponds and pools.

DISTRIBUTION: Angola, Botswana, Namibia and Zimbabwe. Also in Madagascar.

14. **Marsilea schelpeana** Launert in Mitteilungen der Botanischen Staatssammlung München 3: 506 (1960); Jacobsen: 484 (1983); Schelpe & Anthony: 63 (1986); Burrows: 75 (1990). Type: South Africa, Cape Province, Port Elizabeth Distr., Korsten, near Wireless Station, R. Liversidge s.n. (BOL 265511, holo.).

Chromosome number:  $2n = 50$  (Lesho 1994)

ILLUSTRATIONS: Fig. 16T; Launert: t. 5, fig. 24A–C (1984).

In seasonal ponds and pans or semi-aquatic along streams, 20–700 m.

DISTRIBUTION: South Africa.

15. **Marsilea subterranea** Lepr. ex A.Braun in Monatsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin: 433 (1864) Type: Senegal, Perrotet 996 (B, holo.; BM, iso.).

ILLUSTRATION: Launert: t. 1, fig. 5A, B (1984).

Terrestrial, in seasonally flooded pans and pools.

DISTRIBUTION: Malawi, Senegal and Tanzania.

16. **Marsilea unicornis** Launert in Senckenbergiana Biologica 49: 303 (1968); Launert: 11.4 (1969); Schelpe: 56 (1977); Jacobsen: 484 (1983); Schelpe & Anthony: 62 (1986); Burrows: 75 (1990). Type: SW-Africa, Tsumeb, Dinter 7585 (M, holo.; BM!, BOL, FR, K, PRE, iso.).

ILLUSTRATION: Launert: t. 5, fig. 21 (1984).

In seasonal vleis and pans or along streams, 700–1 800 m.

DISTRIBUTION: Angola, Botswana and Namibia.

17. **Marsilea vera** Launert in Mitteilungen der Botanischen Staatssammlung München 3: 505 (1960); Launert: 11.4 (1969); Launert: 65 (1970); Jacobsen: 486 (1983); Schelpe & Anthony: 64 (1986); Burrows: 78 (1990). Type: SW-Africa, Olukondo, Schinz s.n. (B, holo.).

ILLUSTRATION: Launert: t. 18, fig. A1, 2 (1970).

Seasonal pans and margins and backwaters of vleis, 1 000–1 650 m.

DISTRIBUTION: Botswana, Namibia and Zimbabwe.

18. **Marsilea villifolia** Bremek. & Oberm. ex Alston & Schelpe in Journal of South African Botany 18: 166 (1952); Launert: 64 (1970); Jacobsen: 486 (1983); Schelpe & Anthony: 63 (1986); Burrows: 76 (1990). *Marsilea villosa* Burch. ex Bremek. & Oberm.: 400 (1935), non Kaulf. (1824). Type: Bechuanaland, pan south of koppies, 07/05/1930, G. van Son s.n. (BOL!, holo.; B, BM!, K!, PRE, iso.).

ILLUSTRATION: Launert: t. 18, fig. B1, 2 (1970).

Along rivers or in dry riverbeds and pans, 800–1 200 m.

DISTRIBUTION: Botswana, Namibia and South Africa.

## Suborder SALVINIINEAE

34. **SALVINIACEAE** *T.Lestib.*, Botanographie élémentaire: 448 (1826), as *Salviniées(-eae)*. Type: *Salvinia* Ség.

Plants free-floating aquatics. *Rhizome* protostelic, branched; roots absent. *Fronds* in whorls of three, each group consisting of two dorsal floating fronds, these simple and photosynthetic, and a ventral, strongly branched, submerged frond, floating fronds with a costa and anastomosing lateral veins without included veinlets, adaxially with papillae, papillae simple or the apex with an open basket, rhizome, submerged frond and floating fronds abaxially with uniseriate hairs. *Sporangia* heterosporous, borne on the submerged fronds, surrounded by a globose indusium or the sporocarp, the basal sporocarps megasporangiate, others microsporangiate, without a dehiscing mechanism; microsporangia with 32 or 64 microspores enclosed in a massula; megasporangia with a single, trilete megaspore, shallowly rugose. *Gametophyte*: microgametophyte endosporic, reduced to a few cells, with two reduced antheridia; megagametophyte free-floating, cordate, with a few archegonia. Chromosome number based on  $2n = 18$ .

Monotypic. The family dates back to the late Cretaceous (Hall 1974) and its affinity remains unknown.

**0204300 SALVINIA** Ség., *Plantae veronenses* 3: 52 (1754). Type: *Salvinia natans* (L.) All.; *Marsilea natans* L.

Generic description as for the family. A genus of approximately 10 species occurring in the temperate and tropical parts of the world.

**KEY TO THE SPECIES:**

- Apex of the frond-papilla without an open basket of 4 curved cells ..... 1. ***S. hastata***  
 Apex of the frond-papilla with an open basket of 4 curved cells ..... 2. ***S. molesta***

1. ***Salvinia hastata*** Desv. in *Mémoires de la Société Linnéenne de Paris* 6: 177 (1827); Schelpe: 67 (1970); Schelpe & Diniz: 67 (1979); Jacobsen: 491 (1983). Type: Reputedly from Réunion, but probably from Madagascar, *sine coll. s.n.* (P, holo.).

**ILLUSTRATION:** Schelpe: t. 19, f. A1–3 (1970).

In the backwaters of streams and lakes.

**DISTRIBUTION:** Kenya, Malawi, Mozambique and Tanzania. Also in the Madagascan region.

2. **\**Salvinia molesta*** *D.S.Mitch.* in *Fern Gazette* 10: 251, 252 (1972); Schelpe & Diniz: 66 (1979); Jacobsen: 490 (1983); Schelpe & Anthony: 67 (1986); Burrows: 80 (1990). Type: Zimbabwe, Lake Kariba, Ruziruhuru River inlet, 484 m, 26/05/1972, *D.S. Mitchell 1330* (SRGH!, holo.; B, BM, BO, BOLI, BR, CAL, CHR, EA, GE, GH, KI, LISB, LO, M, MO, NSW, P, PDA, PRE, RH, US, WAG, Z, iso.).

*Salvinia auriculata* sensu Schelpe: 67 (1970).

**ILLUSTRATION:** Schelpe: t. 19, fig. B1–3 (1970).

In mud and backwaters of lakes, dams and rivers, often forming extensive free-floating mats.

**DISTRIBUTION:** Botswana, Democratic Republic of the Congo, Kenya, Malawi, Mozambique, Namibia, South Africa, Tanzania, Namibia, South Africa, Zambia and Zimbabwe. A notorious aquatic weed introduced to many parts of the world.

35. **AZOLLACEAE** *Wettst.*, *Handbuch der systematischen Botanik* 2: 77 (1904). Type: *Azolla* Lam.

Plants free-floating aquatics. *Rhizome* protostelic, branched; roots simple, the cortical cells mostly aerenchymatous. *Fronds* sessile, alternate, dorsally in two rows, equally lobed, both bearing chlorophyll, the aerial lobe with a large mucilage cavity housing the blue-green alga *Anabaena*, with a single anastomosing vein, and floating lobe with a short simple vein; stomata of the anomocytic type. *Indumentum* composed of simple, two to three-celled trichomes confined to the rhizome and the base of the sporocarps and with bulging epidermal cells abaxially on both frond-lobes. Sporocarps paired, or in fours, born on the first frond of the lateral branch with the lower lobe reduced to two sporocarps, heterosporous; microsporocarp larger than the megasporocarp, without a dehiscing mechanism, microsporangium long-stalked, simple, uniseriate throughout, capsule spheroidal, without a dehiscing mechanism. Spores clustered into three or more massulae with or without anchor-like glochidia; receptacle with simple, uniseriate trichomes; megasporocarp with a single megasporangium that produces a single megaspore, megaspore proximally with a columella, hair-like filaments and an apical massulae. *Gametophyte*: endosporic; microspores germinating within the massula, microprothallium reduced to a single antheridium; megaprothallium develop in the megaspore exposing several archegonia after forcing the laesura open. Chromosome number based on  $2n = 44$ .

Azollaceae is a monotypic family and fossil evidence suggests it dates back to the Palaeocene (Collinson 1991), but its affinity remains unknown.

**0204400 AZOLLA** Lam., *Encyclopédie méthodique. Botanique* 1: 343 (1783). Type: *Azolla filiculoides* Lam.

Generic description as for the family.

A genus of six species with a pantropical distribution, but now introduced to many parts of the world.



## KEY TO THE SUBGENERA:

- Sporocarps arranged in twos ..... 1. subgen. **Azolla**  
 Sporocarps arranged in fours ..... 2. subgen. **Tetrasporocarpia**

Subgenus **Azolla**

Two sections are recognized in subgenus *Azolla*.

## KEY TO THE SECTIONS:

- Stems glabrous; with 3 floats per megaspore apparatus; massula glochidiate ..... 1. sect. **Azolla**  
 Stems with trichomes; with 9 floats per megaspore apparatus; massula eglochidiate ..... 2. sect. **Rhizosperma**

1. Section **Azolla** Mett. in Linnaea 20: 273 (1847). Type: *Azolla filiculoides* Lam.

\***Azolla filiculoides** Lam., Encyclopédie méthodique. Botanique 1: 343 (1783); Jacobsen: 494 (1983); Schelpe & Anthony: 68 (1986). Type: Cette plante a été rapportée de Magellan, *Commerson s.n.* (P-LA!, holo.).

ILLUSTRATION: Schelpe & Anthony: t. 17, fig. 1, 1a, b (1986).

Form dense mats on rivers, dams and seasonal pans and is well known as a notorious weed.

DISTRIBUTION: Introduced to Egypt, Namibia, South Africa and Zimbabwe.

2. Section **Rhizosperma** (Meyen) Mett. in Linnaea 20: 273 (1847), emend. R.M.K.Saunders & K.Fowler (1993). *Rhizosperma* Meyen: 523 (1836). Type: *Azolla pinnata* R.Br.

**Azolla pinnata** R.Br., Prodrum florae Novae-Hollandiae et insulae Van-Diemen: 167 (1810); Sim: 312 (1915). *Rhizosperma pinnata* (R.Br.) Salomon: 112 (1883). Type: Richmond, Hawkesbury, Australia, 10/1804, *R. Brown 134* [BM, lecto., designated by Saunders & Fowler (1992); E, K, isolecto.]; Paterson's River, Australia, 10/1804, *R. Brown 135* (BM, E, K, para.).

subsp. **pinnata** occurs in tropical Africa, Madagascar, Asia and Australia.

subsp. **africana** (Desv.) R.M.K.Saunders & K.Fowler in Botanical Journal of the Linnean Society 109: 351 (1992). *Azolla africana* Desv.: 178 (1827). *Azolla pinnata* R.Br. var. *africana* (Desv.) Baker: 101 (1886c). Type: Africa, *sine coll. s.n.* in Herb. Lavallée (P, holo.).

*Azolla pinnata* sensu Launert: 12.1 (1969); Schelpe: 69 (1970); Schelpe: 57 (1977); Schelpe & Diniz: 68 (1979); Jacobsen: 493 (1983); Schelpe & Anthony: 68 (1986); Burrows: 81 (1990).

Form dense mats on shallow water or lakes, ponds and backwaters of rivers.

DISTRIBUTION: Angola, Benin, Botswana, Burundi, Cameroon, Central African Republic, Chad, Congo, Côté d'Ivoire, Democratic Republic of the Congo, Gabon, Gambia, Ghana, Kenya, Malawi, Mali, Mozambique, Namibia, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda and Zambia. Also in Madagascar.

2. Subgenus **Tetrasporocarpia** R.M.K.Saunders & K.Fowler in Plant Systematics and Evolution 184: 189 (1993). Type: *Azolla nilotica* Decne. ex Mett.

**Azolla nilotica** Decne. ex Mett., Plantae tinneanae: 54, t. 25 (1867); Schelpe: 70 (1970); Schelpe & Diniz: 69 (1979); Jacobsen: 493 (1983); Burrows: 82 (1990). Type: Source of the White Nile, 25/02/1840, *D'Arnaud s.n.* [P, lecto., designated by Saunders & Fowler (1992); K, isolecto.].

ILLUSTRATION: Schelpe: t. 20, fig. 1–4 (1970).

Wet mud and shallow water in stagnant or sluggish streams.

DISTRIBUTION: Burundi, Democratic Republic of the Congo, Gabon, Kenya, Malawi, Mozambique, Somalia, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

## GLOSSARY

|                                |                                                                                                                                                                                                                                                                                               |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>abaxial:</b>                | the side facing away from the axes, the underside of the lamina.                                                                                                                                                                                                                              |
| <b>acicular:</b>               | slender or needle-shaped.                                                                                                                                                                                                                                                                     |
| <b>acroscopic:</b>             | facing or directed towards the apex.                                                                                                                                                                                                                                                          |
| <b>acrostichoid:</b>           | having sporangia scattered over the entire abaxial surface of the fertile lamina.                                                                                                                                                                                                             |
| <b>adaxial:</b>                | the side facing towards the axes; the upper side of the lamina.                                                                                                                                                                                                                               |
| <b>adhesive hairs:</b>         | hairs of the rhizome and stipe (occasionally also the rachis), which develop by cell division of epidermal cells and composed of one or more hair cells with a stiff texture. They occur in the Hymenophyllaceae and their function is to anchor the plant to the substrate (Schneider 2000). |
| <b>aerophore:</b>              | aerating structures, mostly found along the axes.                                                                                                                                                                                                                                             |
| <b>ala:</b>                    | wing, a long narrow membrane.                                                                                                                                                                                                                                                                 |
| <b>alete:</b>                  | spores without a conspicuous laesura.                                                                                                                                                                                                                                                         |
| <b>anadromous:</b>             | the basal segment or vein originating from the anterior (upper) side, the one on the posterior (lower) side originating from a distinctly more distal part.                                                                                                                                   |
| <b>anastomosing:</b>           | joining together, veins forming a network.                                                                                                                                                                                                                                                    |
| <b>anisophyllous:</b>          | distinct leaf types are borne at the same point on the stem.                                                                                                                                                                                                                                  |
| <b>anisotomous:</b>            | dichotomies result in branches that have different orientations and functions.                                                                                                                                                                                                                |
| <b>anisovalvate:</b>           | the two halves of the sporangia are not of equal size.                                                                                                                                                                                                                                        |
| <b>annulus:</b>                | the sporangium cells that causes the discharge of the spores.                                                                                                                                                                                                                                 |
| <b>antheridium:</b>            | the male sex organ borne on the gametophyte.                                                                                                                                                                                                                                                  |
| <b>antrorse:</b>               | directed upwards, opposite to retrorse.                                                                                                                                                                                                                                                       |
| <b>apogamous:</b>              | having the condition of apogamy.                                                                                                                                                                                                                                                              |
| <b>apogamy:</b>                | the formation of a sporophyte from a gametophyte by asexual means rather than fertilization.                                                                                                                                                                                                  |
| <b>archegonium:</b>            | female sex organ borne on the gametophyte.                                                                                                                                                                                                                                                    |
| <b>articulate:</b>             | jointed, separating freely by a clean scar.                                                                                                                                                                                                                                                   |
| <b>basispic:</b>               | facing or directed towards the base.                                                                                                                                                                                                                                                          |
| <b>bipinnate or 2-pinnate:</b> | divided into pinnae bearing pinnules.                                                                                                                                                                                                                                                         |
| <b>biscotiform:</b>            | oblong and slightly constricted in the middle                                                                                                                                                                                                                                                 |
| <b>catadromous:</b>            | the basal segment or vein originating from the posterior (lower) side; the one on the anterior (upper) side originating from a distinctly more distal point.                                                                                                                                  |
| <b>clathrate:</b>              | with thick lateral cell walls and thin superficial walls.                                                                                                                                                                                                                                     |
| <b>coenosori:</b>              | sori grouped together.                                                                                                                                                                                                                                                                        |
| <b>complanate:</b>             | flattened or compressed.                                                                                                                                                                                                                                                                      |
| <b>concolorous:</b>            | uniform in colour.                                                                                                                                                                                                                                                                            |
| <b>confluent:</b>              | blending into one.                                                                                                                                                                                                                                                                            |
| <b>coriaceous:</b>             | leathery.                                                                                                                                                                                                                                                                                     |
| <b>costa:</b>                  | major axis of a pinna or pinnule.                                                                                                                                                                                                                                                             |
| <b>costule:</b>                | an axis that is a branch of a costa.                                                                                                                                                                                                                                                          |
| <b>cultrate:</b>               | shaped like a knife-blade, the sides are parallel to each other.                                                                                                                                                                                                                              |
| <b>cyatheoid indusia:</b>      | the indusium is cup-shaped and completely surrounds the receptacle base.                                                                                                                                                                                                                      |
| <b>dichotomous:</b>            | equally forked.                                                                                                                                                                                                                                                                               |
| <b>dimidiate:</b>              | halved diagonally, with usually one half rudimentary or absent.                                                                                                                                                                                                                               |
| <b>dimorphic:</b>              | having two shapes, the fertile fronds differing from the sterile.                                                                                                                                                                                                                             |
| <b>dorsal:</b>                 | upper side.                                                                                                                                                                                                                                                                                   |
| <b>echinate:</b>               | bearing spines or prickles.                                                                                                                                                                                                                                                                   |
| <b>elater:</b>                 | strap-shaped appendages of <i>Equisetum</i> spores.                                                                                                                                                                                                                                           |
| <b>ephemeral:</b>              | short-lived.                                                                                                                                                                                                                                                                                  |
| <b>epigeous:</b>               | growing on the surface of the ground.                                                                                                                                                                                                                                                         |
| <b>epilithic:</b>              | growing on rocks.                                                                                                                                                                                                                                                                             |
| <b>epiphytic:</b>              | growing on the trunk or branches of shrubs or trees.                                                                                                                                                                                                                                          |
| <b>exindusiate:</b>            | sori lacking an indusium.                                                                                                                                                                                                                                                                     |
| <b>farina:</b>                 | a white or yellow exudate of glands.                                                                                                                                                                                                                                                          |
| <b>frond:</b>                  | the leaf of a fern.                                                                                                                                                                                                                                                                           |
| <b>gemma:</b>                  | a minute asexual propagule produced by some gametophytes, e.g. <i>Vittaria</i> .                                                                                                                                                                                                              |
| <b>glochidium:</b>             | a terminally barbed spine-like hair present on the microspore-bearing structures of <i>Azolla</i> .                                                                                                                                                                                           |
| <b>hemitelioid indusia:</b>    | the indusium does not completely surround the receptacle base.                                                                                                                                                                                                                                |
| <b>heterophyllous:</b>         | having leaves of different forms; the difference may be gradual or abrupt.                                                                                                                                                                                                                    |
| <b>heterosporangiate:</b>      | male and female gametes are produced by different sporangia.                                                                                                                                                                                                                                  |
| <b>heterosporous:</b>          | bearing spores of two sizes and sexes.                                                                                                                                                                                                                                                        |
| <b>homophyllous:</b>           | all leaves are uniform.                                                                                                                                                                                                                                                                       |
| <b>homosporous:</b>            | the spores are all of the same size.                                                                                                                                                                                                                                                          |
| <b>imbricate:</b>              | overlapping.                                                                                                                                                                                                                                                                                  |
| <b>indusiate:</b>              | sori bearing an indusium.                                                                                                                                                                                                                                                                     |
| <b>indusium:</b>               | mostly a thin membrane or structure covering the developing sporangia in a sorus.                                                                                                                                                                                                             |
| <b>isophyllous:</b>            | leaves that are similar in size and shape are borne at the same point on the stem.                                                                                                                                                                                                            |
| <b>isotomous:</b>              | all dichotomies result in equally thick branches, as in <i>Huperzia</i> .                                                                                                                                                                                                                     |
| <b>isovalvate:</b>             | the two halves of the sporangia are of equal size, as in <i>Huperzia</i> .                                                                                                                                                                                                                    |

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|                              |                                                                                                                                              |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>lamina:</b>               | the expanded portion of the leaf blade of a fern frond.                                                                                      |
| <b>ligule:</b>               | a small flap of leaf tissue adaxially near the leaf base in <i>Isoetes</i> and <i>Selaginella</i> .                                          |
| <b>lozenge:</b>              | tablet-shaped.                                                                                                                               |
| <b>massula:</b>              | the hardened mucilage enclosing a group of microspores in <i>Azolla</i> .                                                                    |
| <b>megasporangium:</b>       | a female sporangium producing megaspores.                                                                                                    |
| <b>megaspore:</b>            | a female spore.                                                                                                                              |
| <b>microsporangium:</b>      | a male sporangium producing microspores.                                                                                                     |
| <b>microspore:</b>           | a male spore.                                                                                                                                |
| <b>monolete:</b>             | a spore having a single unbranched scar or laesura.                                                                                          |
| <b>monomorphic:</b>          | having a single shape.                                                                                                                       |
| <b>paraphyses:</b>           | unicellular or multicellular structures borne on the soral receptacle.                                                                       |
| <b>pectinate:</b>            | with narrow linear segments, comb-like.                                                                                                      |
| <b>phyllopodium:</b>         | in species with articulate stipes: the portion of the stipe that remains attached to the rhizome.                                            |
| <b>pinna:</b>                | a sessile or stalked primary division of a compound lamina.                                                                                  |
| <b>pinna rachis:</b>         | see secondary rachis.                                                                                                                        |
| <b>pinnate or 1-pinnate:</b> | divided into pinnae.                                                                                                                         |
| <b>pinnatifid:</b>           | pinnately cleft, but not to the axes.                                                                                                        |
| <b>pinnule:</b>              | a sessile or stalked division of a pinna that is narrowed at the base.                                                                       |
| <b>proliferous:</b>          | bearing bulblets or plantlets on the stipe or lamina axes.                                                                                   |
| <b>pulvinus:</b>             | the swollen base of a petiole.                                                                                                               |
| <b>rachis:</b>               | the main axis of a compound lamina.                                                                                                          |
| <b>receptacle:</b>           | the lamina tissue to which the sporangia are attached.                                                                                       |
| <b>reflexed:</b>             | bent abruptly downwards.                                                                                                                     |
| <b>reticulate:</b>           | joined together to form a network.                                                                                                           |
| <b>secondary rachis:</b>     | the main axis of a pinna, = pinna rachis.                                                                                                    |
| <b>sinus:</b>                | the space between two lobes.                                                                                                                 |
| <b>soboliferous:</b>         | forming runners.                                                                                                                             |
| <b>spike:</b>                | a portion of a stem bearing sessile sporangia.                                                                                               |
| <b>sporangiophore:</b>       | a sporophyll bearing a ring of sporangia facing the axis of the strobilus.                                                                   |
| <b>sporocarp:</b>            | a structure containing the sporangia, as in <i>Marsilea</i> , <i>Azolla</i> and <i>Salvinia</i> .                                            |
| <b>sporophyll:</b>           | a fertile leaf, bearing sporangia or subtending the sporangium.                                                                              |
| <b>stipe:</b>                | the stalk of a frond.                                                                                                                        |
| <b>strobilus:</b>            | the imbricate sporophylls arranged around a central axis to form a cone, as in <i>Equisetum</i> , <i>Selaginella</i> and <i>Lycopodium</i> . |
| <b>subula:</b>               | a fine sharp point.                                                                                                                          |
| <b>superficial:</b>          | on the surface of the lamina.                                                                                                                |
| <b>synangium:</b>            | a group of fused sporangia. as in <i>Psilotum</i> and <i>Marattia</i> .                                                                      |
| <b>trilete:</b>              | a spore having a triradiate scar or laesura.                                                                                                 |
| <b>uncinate:</b>             | hooked                                                                                                                                       |
| <b>velum:</b>                | a membranous covering over the sporangium on the abaxial surface of the leaf base, as in <i>Isoetes</i> .                                    |

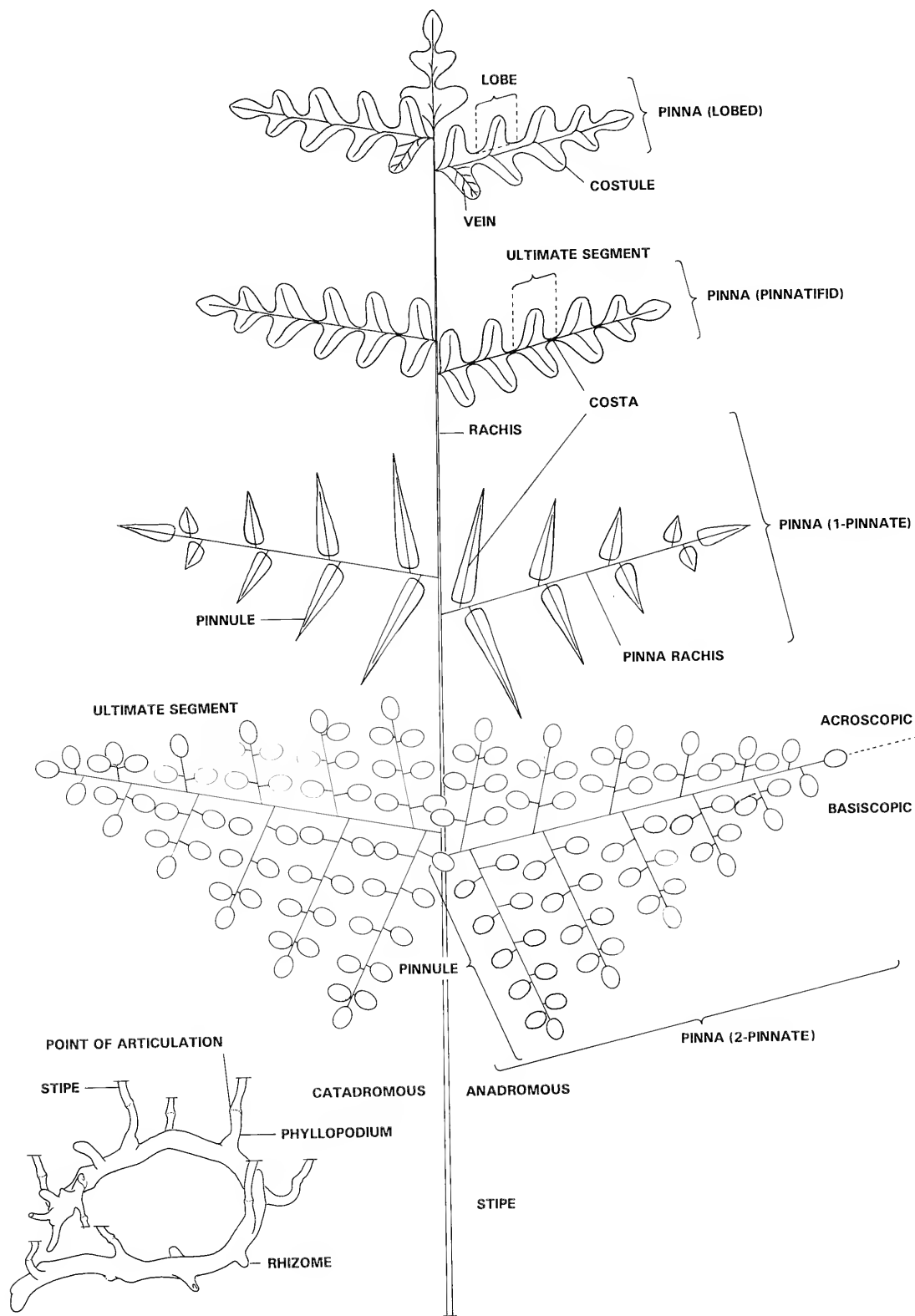


FIGURE 18. A diagrammatic fern frond and rhizome illustrating some terms in the Glossary.

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# ADDENDUM 1

## THE PREPARATION OF PTERIDOPHYTE HERBARIUM SPECIMENS

### Introduction

Much have been written on the preparation and care of herbarium specimens. Most notable, and well known, is *The Herbarium Handbook* by Forman & Bridson (1989) where all aspects of plant collecting, including the management of collections are dealt with in detail. Having visited and studied material at most of the important herbaria in southern Africa I became aware of the often acute shortcomings that exist at most of these institutions and their collections. It is for this reason that a brief overview on the preparation of pteridophyte specimens is provided.

### Why do we prepare herbarium specimens?

Until the 20th century the science of botany was dominated by taxonomic studies. During the 20th century, however, physiological studies and more recently molecular studies largely displaced taxonomy. With an increasing demand for precious biological resources by the rapidly expanding human population, the disappearance of habitats and declining diversity has become a reality. It is therefore of utmost importance that we, with urgency, explore, document, but more importantly, learn to live sustainably with the vast living resources of the planet. Plants are important for mankind as they provide food, energy, medicines, clothing and construction materials. Knowledge about all facets of this resource is clearly very important and we therefore need to know:

- how to recognize them (Identification),
- that they are properly named so that information about them can be disseminated without ambiguity (Nomenclature),
- what their closest relatives are, as they may have similar properties or compatible genetic systems (Classification),
- where they occur (Distribution),
- in what habitats they grow (Ecology),
- what the status of the natural populations is (Conservation), and
- if they have any useful properties (Economic value).

The task of the plant taxonomist is to generate the information that will provide accurate and meaningful answers to these questions. In fulfilling this task, the herbarium serves as an archive and is the most important tool for the plant taxonomist. It is therefore important that the representation and the quality of the material housed in the herbarium are of such a standard that the questions raised can be adequately answered.

### The development of herbaria

The word *herbarium* in its original meaning referred to a book about medical plants, but the term was later used for a collection of dried plants (Stearn 1957). Herbarium specimens are compressed dried plants standardly mounted on firm paper boards which enables them to be treated like cards in a filing system. The purpose of these sheets is:

- they serve as a store of reference material arranged in a particular order or classification system that enables quick retrieval,
- a means of identification, by matching unnamed plants with named specimens
- to maintain nomenclatural standards, the herbarium collections must continuously be scientifically curated, therefore serving as an arbiter for correct names as printed Floras soon become out of date,
- serve as a comprehensive data-bank which, ideally, should represent the diversity, variation, and distribution of the region's vegetation,
- as a last resort, these sheets serve as a source of material for anatomical, palynological and chemical studies.

### Collecting and preparing specimens for the pteridophyte herbarium

It is well known that that there is no substitute for first-hand field observations in any taxonomic revision. Because of financial constraints, however, few taxonomists today have the opportunity to do sufficient fieldwork where all the species in the group they research can be observed, and studied *in situ*. It is therefore important that collectors, when preparing herbarium collections, keep the following in mind:

- The end user may not have the opportunity to study the species in the field. Collections must therefore be complete and properly prepared. The information assembled in Floras and monographs is often largely based on herbarium collections. The quality of the information presented in these works is therefore often a direct reflection of the quality of the specimens on which the observations were made.
- The preparation and maintenance of herbarium collections is expensive. Rather have a few quality specimens than large numbers of scraps.
- Once mounted, the material should fit neatly onto a sheet; overhanging tips get easily abraded. Care must therefore be taken in preparing the specimens.
- The material should ideally be fertile with at least one frond, or part thereof, being mounted in such a way that the spore-bearing surfaces are shown.
- Spread the fronds in such a way that clear observations of individual fronds and pinnae can be made. In many species it may be necessary to remove some of the fronds to avoid overcrowding. When this is done the number of live fronds borne by the plant should be indicated on the label.
- The collecting label that accompanies the collection must contain all the relevant information e.g. the collector's name and number, date, exact locality -narrowing it down from country to district to town or village to farm, river, mountain, kloof etc., and should a GPS (Global Positioning System) be available also the grid reference -remember, someone else may need to go back to the same locality), altitude, notes on the habitat, ecological observations, and population size at locality, local uses and names.

The preparation of smaller fern species and allied plants generally do not pose a problem. These collections mostly contain rhizomes with complete fronds attached to them. The problem generally lies where a complete plant (roots, rhizome and frond) do not fit onto

a single sheet. Finding complete specimens of these species in herbaria is a serious weakness in most collections. This problem has been repeatedly stressed by Holttum (1957), Stolze (1973) and Brownsey (1985) and has been encountered by myself. A summary of the pleas for better collections is provided below.

For medium-sized ferns where a plant is too big to fit onto a single sheet, it may be necessary for the fronds to be cut into suitable sections and dried separately rather than folding them. These sections must be mounted separately onto sequentially numbered sheets to provide a complete specimen that can be reassembled in the herbarium. If the lamina is too wide to fit onto a sheet the pinnae on one side of the lamina may be trimmed away still leaving enough to indicate their position relative to the remaining pinnae. Where the rhizome is too bulky, it may be halved longitudinally. A complete specimen of a medium-sized fern may require up to five herbarium sheets.

Preparing good herbarium specimens of large ferns requires more skill, effort, time and space in the plant press. Ideally, a photograph of the entire plant as well as that of a complete frond prior to cutting up should be taken. For large ferns such as *Hypolepis*, Brownsey (1985) suggests the following technique:

- Divide the frond into suitable sections approximately the size of a herbarium sheet. As in medium sized ferns, it may be necessary to remove and discard the pinnae on one side of the rachis.
- It is advisable to collect a section of the rhizome apex, as this will contain indumentum, generally abraded on the older parts of the rhizome. Enough of the rhizome should also be taken to indicate the distance between the fronds. Dry the rhizome with the stipe (which may be folded or cut into suitable sections) attached to it separately to avoid bruising and folding of the lamina. The basal part of the lamina should be left with a small piece of the stipe.
- The frond sections must be labelled consecutively from the apex to the base (e.g. A, B, C1, C2, C3a, C3b etc.) so the frond can be easily reconstructed.
- The sections must be pressed individually, avoiding folding as far as possible. In very large fronds where the cutting of pinnae is unavoidable, a more elaborate numbering system may be required.

The following measurements should be taken and provided on each of the collecting labels:

For large ferns where the fronds are often several metres long, it is advised that the apical pinnae, the longest pinnae, attached to a section of the rachis, the basal part of the stipe and a section of the stipe attached to the basal pinnae be prepared. The base of the stipe should be cut from the caudex to ensure that the paleae are included. Since the paleae are easily lost, it is advisable that some be carefully removed and stored in an envelope, which can be attached to the sheets when mounting is done. It is also suggested that young fronds with undamaged paleae be included in the collection.

For these large ferns it is necessary to include more information on the herbarium label than the usual habit and habitat notes. The following notes and measurements should be included:

- length and breadth of the lamina,
- length and diameter of the stipe,
- the height and diameter of the rhizome or caudex,
- the presence or absence of aerial roots,
- the number of fronds,
- are the fronds produced synchronously or sequentially?,
- the angle at which the fronds are held to the caudex,
- are they shed from the trunk when dead or are they retained as a skirt,
- how far apart are the fronds spaced on the rhizome or caudex?,
- how many fronds are there in a complete whorl?

#### Additional techniques

Filmy ferns (Hymenophyllaceae) may require special attention. Not only do they dry out very quickly, but also frequently more than one species occupies the same site. If the species grow interspersed, they must be separated and each collection provided with its own collecting number. Filmy ferns should ideally be collected in plastic bags and if they have dried out, they should be left in water for a few hours to revive before pressing.

*Pyrrhosia* species during the dry season also have the habit of shrivelling up when the moisture levels become too low. These plants will also regain their turgidity if left overnight in a sealed plastic bag with water, after which they can be pressed.

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## ADDENDUM 2

### NEW RECORDS

At the time of going to press the author discovered an as yet unidentified species of *Pilularia* L. in South Africa. This is the first known record of the genus for the African continent and will be reported on elsewhere.



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